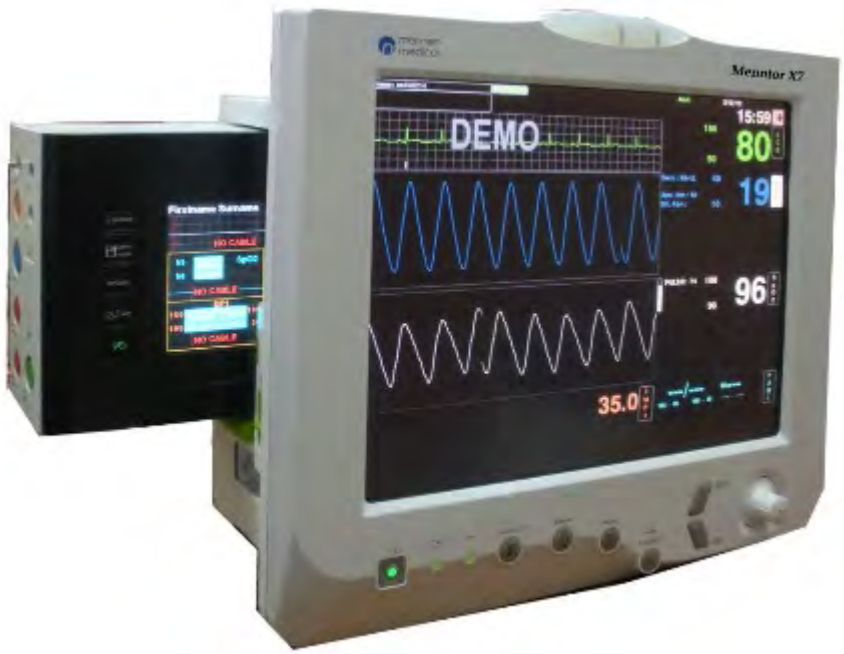
mennen medical

Menntor X7

Modular Patient Monitors

USER MANUAL



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SECTION 1
INTRODUCTION

This section contains the following chapters:

1. What You Should Know
2. Warnings and Safety Precaution
3. System Description
4. Installation
5. Maintenance and Cleaning
6. Controls and Functions

CHAPTER 1:
WHAT YOU SHOULD KNOW

Training

Mennen Medical or it's authorized distributer will provide training for the system user as per the intended use of the device or system.

The training may be personal or by training the trainers.

The scope of the training is part of the agreement between Mennen Medical or it's authorized distributer and the end user.

It is the responsible of the hospital management that only users that were trained to use the equipment efficiently and safely, should operate the equipment

Service

Only Service Engineers trained and approve by Mennen Medical are allowed to perform service to Mennen-Net equipment.

Monitor configuration is password protected and is allowed to users that have received permission by the hospital System Manager or administrator.

"Menntor X7 Service manual" will be provided to Service Engineers trained and approve by Mennen Medical.

Prescription Notice

CAUTION! *Federal law restricts this device to sale by or on the order of qualified medical personnel only.*

User Capability

Patient monitors are used by nurses under the supervision of physicians.

System Setup, is password protected and should be modified only by the System Manager authorized by the department director (a Physician).

General Description

Menntor X7, is a modular patient monitor with a Multi Parameter Module MX57 that serves as a front end amplifier and signal conditioner for the commonly used vital signs, and two additional plug-in modules.

The MX57-MPM will be offered for either Non Invasive monitoring or Invasive monitoring.

In the Non Invasive option it will measure: ECG/Resp/2Temp/NIBP/SpO2

In the Invasive option it will add measurement of 2 or 4 Invasive blood pressures and Cardiac Output.

The MX57 -MPM will have an optional LCD display [751-OPT-057], that will allow it use the MPM as a transport monitor (see chapter 33).

Menntor X7 Part Numbers

The following tables provide part numbers for Menntor X7.

Table 1-1: Menntor X7 host Part Numbers

Part Number	*Description*
791000000	Menntor X7 Base Unit Assembly
791OPTXXX	Menntor X7main frame
791OPT012	Menntor X7 Touch Screen Option
791OPT014	Menntor X7 Non Touch Screen Option
791OPT010	Menntor X7 Battery Option One Battery
791OPT020	Menntor X7 Battery Option Second Battery
791OPT119	Menntor X7 Wireless Option EU
791OPT219	Menntor X7 Wireless Option UA
791OPT400	Menntor X7 Recorder Option
791OPT008	Menntor X7 Flash Memory 16GB Option

Table 1-2: MX57 Multi Parameter Module Part Numbers

Part Number	*Description*
	Non Invasive monitoring
751000010	MX57 (3/5ECG/Resp/2Temp/NIBP/SpO2) Covidien

Table 1-2: MX57 Multi Parameter Module Part Numbers

Part Number	*Description*
751000012	MX57 (12ECG/Resp/2Temp/NIBP/SpO2) Covidien
751000020	MX57 (3/5ECG/Resp/2Temp/NIBP/SpO2) Massimo
751000022	MX57 (12ECG/Resp/2Temp/NIBP/SpO2) Massimo
751010012	MX57 (12ECG/Resp/2Temp/NIBP/SpO2) Covidien LCD
751010022	MX57 (12ECG/Resp/2Temp/NIBP/SpO2)Massimo LCD
	Invasive Monitoring
751010212	MX57 (12ECG/Resp/2Temp/NIBP/SpO2/2IBP/CO) Covidien LCD
751010412	MX57 (12ECG/Resp/2Temp/NIBP/SpO2/4IBP/CO) Covidien LCD
751010222	MX57 (12ECG/Resp/2Temp/NIBP/SpO2/2IBP/CO) Massimo LCD
751010422	MX57 (12ECG/Resp/2Temp/NIBP/SpO2/4IBP/CO) Massimo LCD
751OPT119	MX57 Wireless Option EU
751OPT219	MX57 Wireless Option UA

Table 1-3: Plug in modules

Part Number	*Description*
ETCO2 module	751142000
Spirometry module	751137000

Manual Structure

The manual is divided into four sections.

- **Section 1** introduces the Menntor X7 bedside monitor and provides a general overview of the system, including standard operating techniques.
- **Section 2** includes a general discussion of alarms. It also provides information about setting up the patient display, admission and discharge procedures and reviewing patient data.
- **Section 3** describes vital sign monitoring procedures performed by the Menntor X7 bedside monitor.
- **Section 4** includes appendixes referring to available accessories and troubleshooting.

Changes in Default Configuration

This manual describes the standard default configuration of all parameter functions in the Menntor X7 bedside monitor as provided by Mennen Medical. This configuration can be changed according to your hospital's needs by your Biomedical Engineering department, System Administrator or a Mennen Medical service engineer. If any deviation from the description provided in this manual is apparent, consult your hospital's Biomedical Engineering department or System Administrator.

Intended Use

Menntor X7 is intended for use as a multi-parameter physiological patient monitoring system.

The Menntor X7, is a modular monitor with a Multi Parameter Module (MX57, MPM) that can monitor ECG/heart rate, invasive blood pressures, temperature, pulse oximetry, respiration, non-invasive blood pressure, and Cardiac Output

The Menntor X7 can also monitor EtCO2, Spirometry and EEG, and display aEEG.

The MPM (MX57) is equipped with a battery and can continue monitoring it's vital sign when out of the host Menntor X7

This effectively allows the Menntor X7 to monitor a wide-range of adult, pediatric and neonatal patient conditions, in many different areas of the hospital.

Functions include display of multi-parameter waveforms, vital signs, alarm & status messages.

The Mennen Medical Menntor X7 is intended for sale as a system for monitoring and recording patient information on any in-hospital application requiring patient monitoring.

- Critical Care Patients
- Cardiac Step-down Units
- Emergency Departments
- Intra-operative (Anesthesia) Monitoring
- Post Anesthesia Care
- VitaLogik 6000 6500 has full monitoring capacity and includes: ECG, NIBP, SpO2, Temperature, 2 (4 - optional) BP and CO/2 Temp with optional EtCO2

Compliance

The Menntor X7 bedside monitor is designed to comply with the international safety requirements for medical electrical equipment IEC 60601-1, IEC 60601-1-8, IEC 60601-2-27, IEC 60601-2-49, and AAMI voluntary performance standards for cardiac monitors.

The Menntor X7 bedside monitor is also designed to comply with the international EMC requirements for medical electrical equipment IEC 60601-1-2.

European Directive 93/42/EEC as amended by 2007/47/EC, classifies the Menntor X7 bedside monitor as a Class IIb device. The NIBP and SpO2 are classified as Type BF equipment. The ECG and Dual BP and CO/2 Tmp are classified as Type CF equipment for direct cardiac application. (See page 2-5 for the relevant symbols used on the inputs.)

The inputs are floating inputs and are protected against the effects of defibrillation and electrosurgery. If the correct electrodes are used and applied in accordance with the manufacturer's instructions, the screen display will recover within 5 seconds of defibrillation. The Menntor X7 is designed as a Type CF equipment to have special protection against electric shocks (particularly regarding leakage current) and is defibrillator proof.

Network – Mennen-Net

Menntor X7 and all other Mennen Medical monitors can be connected to a Local Area Network – LAN by wired or wireless connection (optional).

The Network enables the Ensemble – Central Nurse Station and the Enguard – Remote Monitor to view patient data at the central station or doctor's room.

It also enables each monitor to view remote monitors that are on the Mennen-Net.

Interface to Hospital Information System – HIS is also available via a server router.

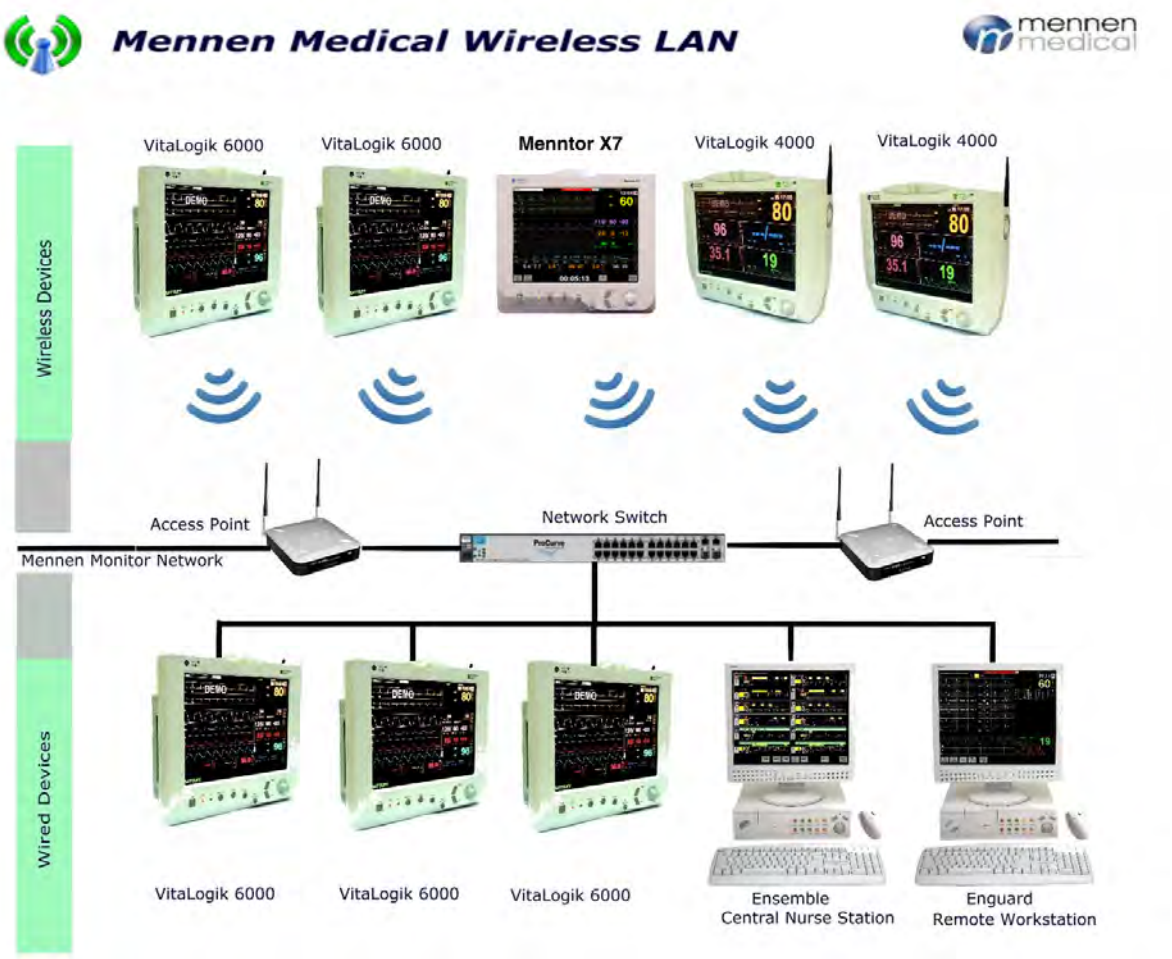


Figure 1-1: Mennen-Net

CHAPTER 2:
WARNINGS AND PRECAUTIONS

The terms Warning, Caution, and Note have specific meanings in this chapter.

WARNING!!! advises against certain actions or situations that could result in personal injury or death.

CAUTION! advises against actions or situations that could damage equipment, produce inaccurate data, or invalidate a procedure, although personal injury is unlikely.

NOTE provides useful information regarding a function or procedure.

The ***Menntor X7*** bedside monitor is designed to comply with international safety requirements for medical electric equipment, and AAMI voluntary performance standards for cardiac monitors.

WARNING!!!: *Do not use the unit in an atmosphere with flammable anesthetic mixtures.*

The system is designed to have special protection against electric shocks and is defibrillator-proof.

WARNING!!!: *Do not touch the patient, bed or instrument during defibrillation.*

CAUTION! *Connect the monitor to the main power whenever available. Note that when the monitor works on battery a "**Battery**" label appears on the display.*

WARNING!!! *The use of the ME EQUIPMENT is restricted to one patient at a time.*

Power Failure

The monitor is equipped with battery backup to ensure continuous monitoring in case of a power failure. However , if a prolonged power failure is expected, it is strongly recommended to use Un Interrupted Power Supply - UPS to ensure continuous monitoring in case of power failure.

Minimizing Electrosurgical Interference

How Electrosurgery Interference Affects Patient Monitoring

An electrosurgery (ES) device uses voltages which may interfere with the monitored ECG. Radio Frequency (RF) voltages ranging from hundreds to thousands of volts generated by these ES devices are present at the active electrode and are transferred directly to the patient's body during electrosurgery.

This produces ES interference in one, or both, of two possible modes. The most important is "conduction", in which case the RF signal is carried on and through the patient's body. The other, "radiation", occurs when RF noise is transmitted through the air and induced in the monitoring devices and their cables.

Suppose that an ES device is set so that the voltage at the active electrode in 100 volts (approximately the minimum setting). Assuming a reduction (attenuation) of the signal by 100,000 times through the body's natural impedance and by electrical filtering, the ES signal at the ECG lead connection would still be 1 millivolt - just equal to the magnitude to the ECG signal. Complicating the situation is the fact that some electrosurgery devices are designed to superimpose other signals on the RF to generate different cutting or coagulating effects.

These superimposed signals are often at the same frequencies as ECG components, making it difficult to separate the unwanted interference from the ECG signal with electronic filters. Good monitoring techniques, however, may be used to enhance the quality of the signal, reducing the burden on the filtering.

Conduction

The electrosurgery RF signal flows through the patient from the active electrode to the return plate. If the return plate is directly opposite the active electrode, most, but not all, of the energy goes directly to the return plate. The stray ES voltage spreads out over and through the body, becoming smaller as it moves away from the active electrode. Sites farther from the active electrode have smaller RF signals than those which are close.

Another aspect of interference is caused by the way in which this RF electrosurgical signal spreads away from the active electrode. Because the spread of the signal is basically symmetrical, two sites equidistant from the active electrode will receive basically the same signal, or will be at basically the same RF voltage.

Menntor X7 amplifiers measure the difference in voltage between their positive and negative inputs. If the ECG electrodes are placed at equal distances from the active electrode, they will have equal RF voltages. With no voltage difference between the positive and negative inputs, the ECG amplifier will have no RF voltage difference to measure and, therefore, no interference. In actual practice, it

is probably impossible to place the electrodes exactly equidistant from the active ES electrode. The effort in attempting to do so, however, is well spent, as it tends to minimize the magnitude of “difference mode” interference.

In summary, conduction interference can be minimized by:

1. Using the lowest possible ES power setting.
2. Placing the return plate directly under the surgical site.
3. Placing the ECG electrodes as far from the ES site as possible.
4. Placing the ECG electrodes equally distant from the ES site.
5. Placing the ECG electrodes on the frontal or all on the posterior surface.

Radiation

Radio frequency (RF) voltage always generates an electromagnetic. The intensity of the radiated field, at any point in space, is directly proportional to the source’s voltage and inversely proportional to the distance from the source. In the case of electrosurgery, the active electrode, return plate, and their cables act as transmitting antennas.

Electromagnetic fields radiate perpendicular to their associated cables. Therefore, susceptibility of the ECG cable to this RF is maximum when the ECG cable is parallel to the ES cable. Separating or placing cables perpendicular to one another will minimize radiation coupling effects.

In summary, radiation interference can be minimized by:

1. Using the lowest possible ES power setting.
2. Keeping ECG cables as far from ES cables as possible.
3. Keeping ECG cables at right angles to ES cables.

Electrical Shock Hazard

The monitor is designed according to IEC 60601-1 safety standard.

The front-end of all applied parts has double isolation which ensures that the leakage current will not exceed the safety limits.

Connection of Other Medical Devices

Connection of other medical devices to the ***Menntor X7***, unless specifically recommended by Mennen Medical, Ltd., may compromise the performance and/or patient safety of the unit. When in doubt, contact the company for specific compatibility data.

WARNING!!! *Connection of other medical devices without Mennen Medical approval might jeopardize patient safety.*

Explosion Hazard

This device is not intended for use in the presence of flammable anesthetic agents.

Environmental Status

When the Menntor X7 is working on battery, the environmental temperature should not exceed 40^0C .

The battery should be stored, separated from the monitor, at a temperature that does not exceed 25 ^{0}C.

Monitor Storage

CAUTION! *If the monitor is stored for a long period, remove the battery and store it separately.*

Use of Manual

The instructions for use presented in this manual should in no way supersede established medical protocol concerning patient care.

Responsibility

Mennen Medical, Ltd. considers itself responsible for the effects on safety, reliability, and performance of the equipment only if:

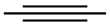
- Repairs are carried out by authorized Mennen Medical personnel only.
- Electrical installation of the relevant room complies with the appropriate requirements.
- The equipment is used in accordance with instructions for use.

WARNING!!! *Do not modify this equipment without the authorization of the manufacturer.*

Labeling

Symbols

The following is a short description of the meaning of the various symbols which appear on the ***Menntor X7*** and their location on the equipment.

Symbol	*Description*	*Location of Symbol*
	Alternating Current	At the rear of the Processing unit.
	Equipotential	At the rear of the Processing unit.
	Attention, consult accompanying documents (Service to be performed by qualified technician, consult service manual before removing cover)	On Processing unit.
	Off (power disconnection from main power supply)	On right of Processing unit.
	On (power connection to the main power supply)	On the right of the Processing unit.
	Type BF applied part defibrillator-proof	On NIBP and SpO2.
	Type CF applied part - direct cardiac application defibrillator-proof	On ECG, and Dual BP and CO/2 TMP.
	Fuse	At the rear of Processing unit.
	Type BF applied part	On CerebraLogik input
	Refer to instruction manual/ booklet	On device label
	Restricts the sale and use of this instrument to qualified medical personnel only.	On device label
	Not for use in explosive gas environment	On device label

Symbol	*Description*	*Location of Symbol*
	Electrical and electronic equipment - Dispose according to local regulation	On device label
	Date of manufacture	On device label
	CE Mark	On device label

Identification Label

The Identification label is located at the back of the monitor.

Figure 2-1: The Indentification Label Menntor X7

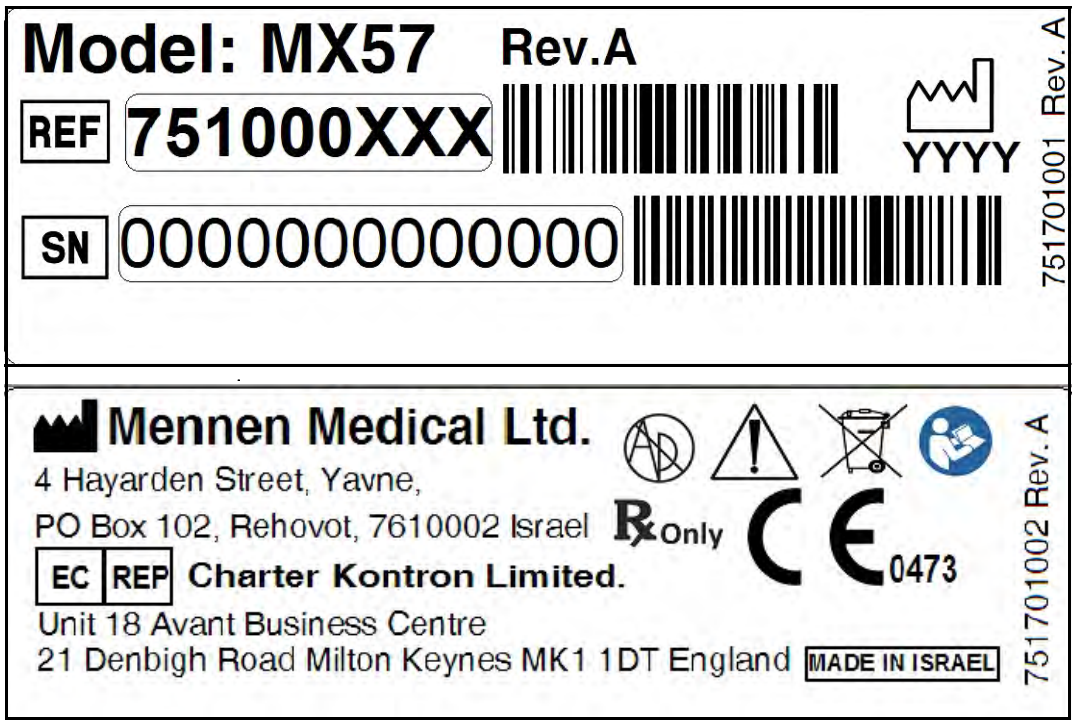


Figure 2-2: The Indentification Labels MX57 - MPM

The labels includes warnings and compliance information as follows:

- Identification information: Part Number (P/N), Serial Number (S/N), and model name
- Electrical power information: Voltage, Current, and Frequency
- Warnings: Disconnect supply before servicing, replace fuse as marked

Electrode and Transducer Protection

The Electrodes and Blood Pressure Transducers recommended for use with the equipment and the equipment itself are provided with protective means against burns to the patient when used with high frequency surgical equipment.

Immunity requirements of IEC Collateral Standard 60601-1-2 for Electromagnetic Compatibility are met with the transducers recommended for use with the unit (see Appendix A).

General Use of Accessories

- Use only Mennen Medical approved accessories with the Menntor X7. This includes, but is not limited to, those accessories approved for use with the Vital Signs: ECG, BP, CO/Temp, NIBP, SpO2, and EtCO2.
- Do not use a damaged accessory. Always refer to the instructions for use included with each accessory.
- A disposable (single patient) accessory should not be sterilized or cleaned for reuse.
- Use care when installing accessories such as adapters and cables. Do not use force. Do not cause tension in cables when connecting them to the vital signs sockets.

CAUTION! *Accessories are connected to the monitor using interface cables. Take special care to prevent cable entanglement.*
Take care not to pass the cables around the patient's head and neck in order to prevent possible strangulation.

Disposal of Monitors and Accessories

Dispose of the equipment and its accessories, according to the rules and regulations of your country.

CHAPTER 3:
SYSTEM DESCRIPTION

Overview

The **Menntor X7** bedside monitor is a standalone bedside unit consisting of a main processing unit and a built-in color monitor.

The **Menntor X7** monitors the patient's vital signs.

The vital signs data derived by the **Menntor X7** is presented on the monitor as waveform and numeric displays.

The **Menntor X7**' user interface is especially designed for user-friendly operation. The fixed buttons and unique QuicKnob™ control on the front panel of the main processing unit enables quick and direct access to system parameters and functions.

An optional Touch Screen is available for control of the **Menntor X7** setting and menus without the hardware keys and QuicKnob™.

Figure 3-1: The Menntor X7 Bedside Monitor

System Features and Capabilities

The **Menntor X7** displays a wide range of vital sign clinical parameters. It includes:

- ECG/Respiration multi-lead for monitoring ECG and respiration.
- Dual (four optional) BP inputs for monitoring two invasive blood pressures.
- CO/2TMP connector to measure either thermodilution Cardiac Output or two temperatures.
- Temp connector.
- NIBP input for monitoring non-invasive blood pressure using the oscillometric method.
- Pulse Oximetry.
- Microstream End Tidal CO2 (EtCO2) for monitoring CO2 during exhalation (EtCO2) and inhalation (inCO2) and Respiration Rate.
- CerebraLogik dual channel EEG and aEEG
- Serial Input for communication and interface with an external, auxiliary device.

The **Menntor X7**'s main monitoring features include:

- Continuously updated vital sign parameter data displayed as numeric values and continuous waveforms.
- Clinical and technical alarm detection as well as alarm notification in audio and visual formats.
- Easy access to collected data in the form of tabular charts and graphical trends as well as various types of clinical reports.
- Patient data output to a recorder or a printer, if connected.

You can interact with the **Menntor X7:**

- Using interactive panels

  These panels include menus and dialog panels that enable you to configure system and monitoring parameters.

- Responding to Events

  Fixed keys on the front panel of the main processing unit enable you to respond quickly to events such as alarms.

- Reviewing Clinical Data

Charts, Trends, Full Disclosure and Overview enable you to view and compare data in different formats and over selected time periods.

Monitor and Main Processing Unit

The **Menntor X7** can display up to eight traces, depending on how the vital sign display is configured. For monitor control procedures, refer to the User's Manual.

All clinical data collected from the inputs is stored in the main processing unit. This data includes waveforms, vital signs, trends, charts and beat-to-beat data.

The main processing unit can store at least 4 days of patient waveform and 80 days of numeric data for review purposes. The front panel of the main processing unit contains 7 fixed keys, and the QuicKnob™. These features enable you to interact with the system. The back panel contains the power connector.

A remote keypad provides direct access, via the orange keys, to the menus of Vital signs, Patient data, and Setup, via the green keys, to Event, Print, Record, and Freeze and by the yellow key to Timer.

This allows the user to reach these functions without opening the Main menu.

For a detailed description of the functions and controls of the main processing unit, see "Main Screen Display Features" on page 6-3.

Display Features

The main screen display is divided into four areas:

- Global Header Area
- Patient Area
- Patient Display Area
- QuicKeys™

For a description of all monitor display features and functions, see "Main Screen Display Features" on page 6-3.

Input Modules

The Vital Signs inputs modules are housed on the left side panel.

They include

- MX57 Multi Parameter Module providing inputs for:
  - 12 Lead ECG/RSP
  - Dual BP (4 optional)
  - CO/2TMP
  - Temp
  - NIBP

- SpO2
- 2 UIM (Universal inputs)
- CerebraLogik EEG amplifier (Optional - connected via UIM)

- EtCO2 MicroStream
- Spirometry

Inputs

The Vital Signs inputs are housed on the left side panel. They include:

- 12 Lead ECG/RSP
- Dual BP
- CO/2TMP
- Temp
- NIBP
- SpO2
- EtCO2 MicroStream

Controls and Outputs

- Video output for external display
- External keyboard and mouse
- Remote keypad or Analog output
- EtCO2 gas outlet

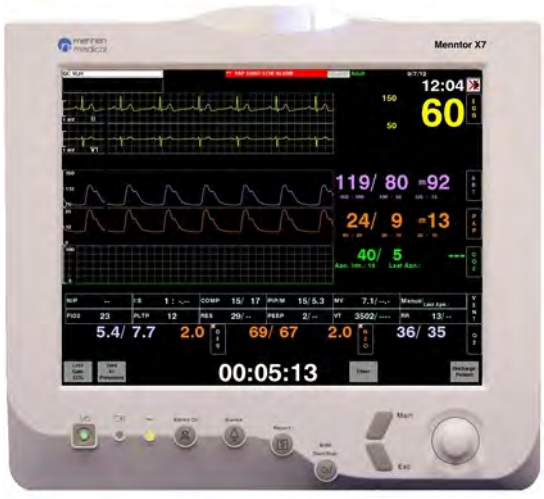


Figure 3-2: Menntor X7 Front Panel

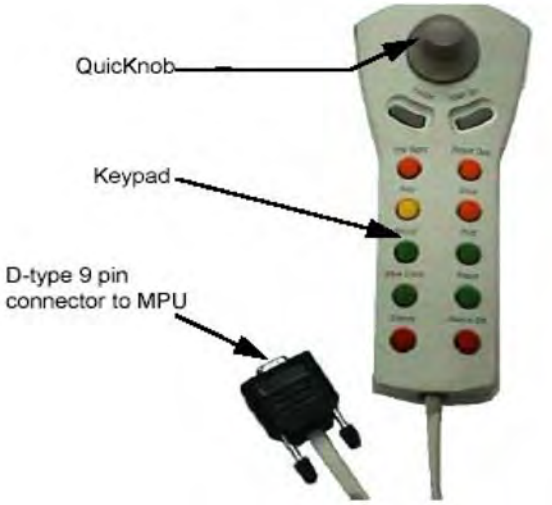


Figure 3-3: Menntor X7 Remote Keypad

Menntor X7 Analog Output

The back DB9 connector can be defined during PO with following options:

- AUX
- MCU Remote.

The table below provides the DB9 pin out for the AUX option.

Table 3-1: 9 PIN on the UUT rear panel AUX Connector (option)

Pin	***Signal***	***Amplitude***
1 (pin 5 ground)	ECG II	1 Volt p-p / 1 mV
2 (pin 6 ground)	ECG V1	1 Volt p-p / 1 mV
3 (pin 7 ground)	ECG Sync	Square pulse 5v, 100 mSec, 40 KΩ
4(pin 6 ground)	ART Pressure	1Volt / 100mHg

Monitors Network

The Menntor X7 can be used as part of a LAN network on which all Mennen Medical monitors and devices are connected.

The network uses a Multiport managed layer 3 switch between all Mennen Medical devices

The LAN network enables Bed to Bed communication as well as connections to:

- Ensemble – Central Nurse Station

- Enguard – Remote monitor
- Enscribe – Strip chart recorder
- Laser network Printer.

Wireless Network (optional)

Monitors equipped with the wireless network option can interface with the monitor's LAN without a hardwire connection.

Note: *No change in functionality will occur as long as the wireless connection is functioning.*

The wireless technology uses a protected wireless network. To prevent loss of data or alarms due to interference, numeric vital signs and alarms are sent to the network every second.

If the monitor is equipped with wireless LAN network transceiver, the RF energy detected by the monitor is displayed near the antenna icon.

WARNING!!! *If the RF energy is low, the monitor will not be viewed by the central nurse station.*

CAUTION! *Consult hospital Biomed, on the area covered by wireless LAN accesses points.*
Leaving this area will not effect the monitor function , but the central nurse station will have no display nor control over the monitor.

Interface with Hospital Network

Mennen Medical monitors can interface with the Hospital Information System – HIS.

Interfacing with the HIS requires using a Mennen Medical Server to switch between the Mennen Medical LAN and the hospital LAN.

The interface requires customization and an agreement between Mennen Medical and the hospital IT department. To provide this interface, contact the Mennen Medical Service department.

System Specifications

See the following pages.

Menntor X7 Specification

Menntor X7 is a modular monitor consisting of a Host Monitor a Multi Parameter Module, and two Single Parameters Modules.

Menntor X7 Host Monitor Specification

Hardware and Parameters

Menntor X7 is a modular monitor with a built-in display and battery back-up.

MX57 - Multi Parameters Module

Non Invasive

- 3/5/12 lead ECG
- Respiration
- NIBP
- SpO2 (Nellcor®)
- 2 Temperatures

Invasive

- 3/5/12 lead ECG
- Respiration
- NIBP
- SpO2 (Nellcor®)
- 2 Temperatures/ 4 Temeratures
- 2 x IBP (optional 4 IBP available)
- CO / 2 additional Temperatures

Universal Input Module - "UIM"

- 2 x RS232 ports
- Interface to other vendor devices:
  - ◊ Anestheic gases: Poet IQ, Andros 4800, Leon Plus, IRMA
  - ◊ Ventilators: EVITA, Monet, Matisse, Saturn Evo, Stephanie, Babylog VN500
  - ◊ Continuous CO: Vigilance, Vigileo, PiCCO2
  - ◊ Other: BISx, CritiCool, Micropod, Radical-7, CerebraLogik

Display-Host Unit

- LCD (1024x768): 15"
- Waveform display horizontal area: 195 mm
- **Numeric Display**
  - ◊ horizontal area: 95 mm
  - ◊ vertical area: 23 mm
- **Very Big Numbers**
  - ◊ One or Two Lead ECG WF
  - ◊ HR height: 45 mm
  - ◊ Four areas with Waveform height: 15 mm
  - ◊ Numeric Vital Signs height: 35 mm
- Interface to a Remote Display
- Waveform Display - Standard
- 7 sec, grid 5 boxes/sec (25 mm/sec nominal)
- up to 8 traces and up to 14 traces (during 12 lead ECG)
- Overlapping Pressure Waveforms mode
- Sweep Speed: 6.25, 12.5, 25, 50, 100 mm/sec (nominal)
- Cardio Respiratory Graph (CRG) - up to 4 parameters
- Big Numbers
- Waveform + Trend Format: 2/3 waveforms and 1/3 graphic Trend
- Very Big Numbers mode

Host CPU Details

- Via X 86 Core Fusion CPU
- Sound Blaster 2W audio power / 8Ω
- Mass storage: 8 GB / 16 GB
- Operating System: QNX 4.25
- Window manager: Photon
- SW upgrades via network or memory card

Dimensions\Weight

Menntor X7 with MX57 MPM Module

HxWxD: 361x392x215 mm (14.2x15.4x8.4 inches)
Weight: 8.5Kg. (18.7 lb) (for basic configuration with battery)

Power requirement

- 100-120 VAC, 2A, 50/60 Hz
- 230-240 VAC, 1A, 50 Hz

Battery

	Menntor X7	
	Single Battery	**Dual Battery**
Lithium Ion	14.8V / 5.2A	14.8V / 10.4A
Operation Time (Hours)	3	6
Charge Time (Hours)	3	6

Environmental Operating Conditions

- Temperature: +5^{0}C to +40^{0}C (41°F to 104°F)
- Humidity: 10 to 93 percent, non-condensing
- Barometric Pressure: 430-795 mmHg (-1250 to 15,000 ft. ; -380 to 5200 meter)

Environmental Storage Conditions

- Temperature: -15C^O to +68C^O (5°F to 154°F)
- Humidity: 10 to 93 percent, non-condensing

Network

- LAN Physical: IEEE 802.3 Ethernet interface 10/100 BaseT
- Protocol: TCP/IP
- Serial Interface RS232 (optional)
- Connectivity to: Ensemble (CNS), Enguard, Enscribe (recorder) and network printer
- Wireless LAN (optional) **includes:**
  - ◊ Utilizes an industry-standard 802.11b/g IEEE compliant radio card
  - ◊ Dual-diversity dipole antenna
  - ◊ Signal strength indicator
  - ◊ WPA security and encryption

User Controls- Host Unit

- 6 Fixed Keys
- Quicknob
- Remote Control Keypad (optional)
- Touch Screen—ELO IT (optional)
- Barcode Reader (optional)

Patient Data storage- Host Unit

- Demographic Data
- Charts - Numerical
- Trend - Graphic
- Full Disclosure - All leads ECG waveform
- Overview - All Waveforms with top ECG
- Event Strips – 20 Seconds of all ECG and Vital signs waveforms (10 sec pre & post event)

Storage	8GB	16GB	32GB
Tabular Chart	80 days	80 days	80 days
Graphic Trend	80 days	80 days	80 days
Full discloser	~5 Days	>8 Days	>8 Days
Overview	~5 Days	>8 Days	>8 Days
Event Strip	75	75	75
aEEG	Not supported	8 Days	8 Days
aEEG Sections	Not supported	50	50
Saved Patient	10	10	10
aEEG Saved Patient	Not supported	3	8
MPM storage time	~5 HR	~5 HR	~5 HR
MPM saved file	3	3	3

Calculations - Host Unit

- Medications
- Hemodynamics
- Respiratory Mechanics
- Oxigenation
- Renal Clearance
- Fick Cardiac Output
- Heart Rate Variability (HRV):
  - ◊ Time Domain
  - ◊ Histogram

Default Alarms - Host Unit

- User defined
- Fixed or calculated values
- Alarm levels:
  - ◊ Clinical levels: C1, C2, C3, C4
  - ◊ Technical levels: T1, T2.
- Visual and Audible alarm
- Output Alarms by Analog Switches

Recorder (Optional) - Host Unit

- Integrated Recorder up to 3 channels

Analog Output - Host Unit

- ECG II – 1Volt/mV (pin1, 5 Gnd)
- ECG V1 – 1Volt/mV (pin2, 6 Gnd)
- QRS – 5 Volt
- ART – 1Volt/100 mmHg (pin4, 8 Gnd)
- Output to input delay < 20 mSec

Languages

- English, Dutch, Espanol, French, Greek, Italian, Polish, Portuguese, Russian, Spanish, Turkish.

Regulatory Approvals

- EN 60601-1
- EN 60601-1-1
- EN 60601-1-2
- Degree of protection against electrical shock
  - ◊ ECG / RSP, IBP, CO and TEMP = Type CF
  - ◊ NIBP, SpO2 and EtCO2 = Type BF
- CE Mark 0473
- FDA Clearance - K073140, K093766—Pending
- WIFI FCC ID XM5-SM2144N1/2
  Industrial Canada 8516A-SM2144N1/2

MX57 - Multi Parameter Module

- The MPM, when disconnected from the host will serve as a stand alone transport monitor
- Monitor Profile and alarm setting are fixed, as received from the host
- Upon return to the host, the data collected during the transport will merge with the data collected by the host

CPU Detail

- Arm Cortex A8
- AC97 Sound Card - 2W audio power 8 ohm
- Mass storage: 2 GB
- Operating System: Linux and TI CCD

Dimension / Weight

HxWxD: 170 x 80 x 225 mm (6.7 x 3.0 x 8.8 inches)
Weight: 1.4 Kg. (3.08 lb)

Display (optional)

- LCD (640 x 480): 5.7" optional
- ECG. One Waveform display horizontal area: 82 mm
  - HR height 20 mm

Power - Battery operated

- Lithium Ion: 16.8 VDC / 2.6 A
- Operation Time: 5 (Hours)
- Charge Time: 4 (Hours) from host

Environmental Operating Conditions

- Temperature: +5C to +40C (41°F to 104°F)
- Humidity: 10 to 93 percent, non-condensing

User Controls

5 Fixed keys : Silence, Event Mark, IBP Zero, NIBP, On/Off

Data Storage

- Storage time
- Demographic Data
- Numerical Vital Sign
- Full Disclosure - All leads ECG waveform
- Overview - All Waveforms with top ECG
- Event Strips (for each event) – 20 Seconds of all ECG and Vital signs waveforms 10sec pre & post event)

Alarms

- Alarm levels:
  - Clinical levels: C1, C2, C3, C4
  - Technical levels: T1, T2.
- Visual and Audible alarm
- Battery Status Alarm

Numeric Display

- **4 areas Big Numbers boxes**
  - horizontal area: 58 mm
  - vertical area: 30 mm
- **Vital Signs**
  - Waveform height: 11 mm
  - Numeric Vital Signs height: 15 mm
  - Sweep Speed: 6.25, 12.5, 25, 50, 100 mm/sec (nominal)

Single parameter modules

- EtCO2
- Spirometry

Dimension / Weight

HxWxD: 95 x 40 x 120 mm (3.7 x 1.6 x 4.7 inches)
Weight: 0.3 Kg. (0.6 lb)

MX57 - MPM Mounting (Optional)

Menntor X7
Clinical Specification

ECG (3 / 5 / 12 Lead)
- Leads: ECG cables for 3/5/12-lead surface ECG with defibrillation protection in the cable.
- Input Dynamic Range: ±5 mV peak to peak
- Input DC Offset: ±530 mV
- Baseline Correction: Automatic recovery of waveform within 100 msec
- Notch Filtering: 50Hz or 60Hz
- Frequency Response:
  - ◊ Diagnostic 0.05 to 150Hz
  - ◊ Monitoring 0.5 to 40Hz
  - ◊ ST 0.05 to 40Hz
  - ◊ Exercise 1 to 25Hz
- Sensitivity: 0.25, 0.5, 1.0, 2.0, 4.0, 8.0 mV/cm (nominal)
- Common Mode Rejection: 120 dB minimum
- Noise: 30 µV
- Input Impedance: 2.5 megaΩ
- Defibrillator Pulse Protection: Yes
- Baseline Recovery: < 8 sec
- Lead Fault Sense: Based on impedance with driven lead: Sense current < 90 nA, DC
- Digital Sample Rate: 640Hz
- Sample Resolution: 24 bit
- Pacemaker Detection and Rejection of Pacer Artifact.
  - ◊ Amplitude: +/- 2 mV to +/- 700 mV
  - ◊ Width: 0.1 ms to 2.0 ms
- Pacer Detection Flag inserted into ECG waveform.
- 3 Detection Modes:
  1. Fixed Threshold 2mV
  2. Adaptive 1 Threshold ½mV High Sensitivity
  3. Adaptive 2 Threshold > 2mV High Immunity
- Auto Cable Detection
- Audio Indicator: QRS Beep—Adjustable volume
- QRS Detection Range:
  - ◊ Height: 0.25 or 0.15 mV to 5.0 millivolt
  - ◊ Width: 70 to 120 milliseconds
- Heart Rate Counting:
  - ◊ Range: 0 to 350 BPM
  - ◊ 0-300 Accuracy: ±2 BPM, 300-350 Accuracy ±4 BPM
- Heart Rate averaging:
  3/4 of last average + 1/4 new beat (about 8 beats between 60 to 120, or 120 to 60)
- **Note**: Values below 20- forced to zero
- Heart Rate Alarm Settings
- High and low rate: 20 - 350 BPM non-overlapping
- Leads analyzed for Heart Rate and Arrhythmia Configuration:
  - ◊ Top two displayed
- ECG Leads:
  - ◊ I, II, III (3 Lead cable)
  - ◊ I, II, III, aVR, aVL, aVF, V (5 Lead cable)
  - ◊ I, II, III, aVR, aVL, aVF, V1-V6 (12 Lead cable)
- ST on all leads:
  - ◊ Automatic or Manual
  - ◊ ST range + 8 mm to – 8 mm
  - ◊ ST Alarm
- Arrhythmia: Detection and alarm on 19 Arrhythmias
- PR and QT measurement and display
- Data Storage:Beat notification, RR Interval, Heart Rate, ST values, Arrhythmia, Alarms, Alarm event markers

Respiration
- Leads: RA-LA or Leads: RA-LL
- Excitation: 65 kHz Sinus wave, < 1 mA
- Input Impedance: >40 KΩ
- Frequency Response: 0.13 to 2.5Hz
- Impedance Range: 100 to 3000 Ω
- Input Sensitivity Range: 0.2 to 5 Ω
- Digital Sample Rate: 640 Hz
- Sample Resolution: 24 bit
- Sweep Speed: ECG speed, 6.25, 12.5 mm/Sec (nominal)
- Gain: Automatic or 1/8 to x 8
- Respiration Rate Counting Range: 0 to 150 breaths/min
- Respiration rate: Accuracy +/- 1 per minute
- Respiration Alarm Settings
  - ◊ Low rate: 0 - 150 BPM
  - ◊ High rate: 0 - 150 BPM
  - ◊ Apnea: User configurable (10, 15, 20, 30, 45, 60, 90 Sec.)
  - ◊ Cardiac coincidence alarm
  - ◊ Modes: Normal / Cardiac
- Data Storage: Respiration rate, Respiration rate Alarms, Apnea alarms Alarm event markers

Invasive Blood Pressure
- Site Labels: BPx, ART, PAP, CVP, RAP, LAP, ICP
- Input Sensitivity: 5 µVolt/Volt/mmHg
- IBP waveform synchronized to ECG
- Dynamic Range
  - ◊ Pressure range: -50 to +350 mmHg
  - ◊ Zero range: ±150 mmHg
  - ◊ Total dynamic range: -200 to +450 mmHg
  - ◊ Heart rate: 20—350 BPM
- Transducer Excitation Voltage: +5 VDC
  Separate excitation driver for each channel
- Zero Accuracy: ±0.2 mmHg
- Zero Drift:
  Less than ±0.2 mmHg in 24 hours, (at constant temperature)
- Blood Pressure Accuracy:
  ±2 mmHg or ±2%, whichever is greater, exclusive of transducer
- Blood Pressure Linearity: within 1% across entire range
- Waveform Frequency Response: 0 - 40 Hz
- Sampling Rate: 640 Hz
- Sample Resolution: 24 bit
- Fault Detection; Transducer in/out, Cable out
- Data Storage:Systolic, Diastolic and Mean; Alarms

Pulse Oximetry (Sp02)
- Nellcor® Oximax
- Plethysmograph waveform
- Saturation Range: 0% to 100% Sp02
- Extreme Alarm Capability
- Sp02 Accuracy: SpO2 % +/-3 digits standard deviation
- Pulse Rate Range: 20 to 250 BPM +/-3 BPM
- Saturation alarm limits: 0% to 100%
- Data Storage:Heart rate and O2 saturation, Alarms

Thermo Dilution Cardiac Output
- Adapter and Compatibility Cables:
  - ◊ CO Set interface cable
  - ◊ Ice Bath YSI-400 cardiac output interface cable
  - ◊ Dual temperature interface cable (YSI-400)
- Temperature Range
  - ◊ Blood temperature: 27^0C to 45^0C (81^0F to 113^0F)
  - ◊ Injectate temperature: 0^0C to 25^0C (32^0F to 77^0F)
  - ◊ Body temperature: 0^0C to 45^0C (32^0F to 113^0F)
- Accuracy ±0.1^0C over the entire range
- Digital Sample Rate: 160 Hz
- Sample Resolution: 24 bit
- Frequency Response: 0 to 15 Hz
- Cardiac Output Determination Range: 0 to 20 liters per minute
- Injectate Volumes: 1, 3, 5, and 10cc
- Displayed Data: Cardiac Output, Cardiac Index, Stroke Volume, Stroke Volume Index, Blood Temperature, Injectate Temperature, Trial Number
- Data Storage:
  In Cardiac Output mode: Cardiac Output, Hemodynamic Calculation results Measuring time
  In Two Temp mode: Temperatures and Delta-Temp, Temperature Alarms

Non-Invasive Blood Pressure
- Oscillometric Method
- Displayed Parameters: Systolic, Diastolic, Mean pressure values, Time of last measurement, and next measurement
- Cuff Size: Adult, Pediatric, Infant, Neonatal
- Inflation Rate: Within 5 sec.
- Initial inflation target: 150 mmHg, Adult/Pediatric
- Initial inflation target: 100 mmHg, Neonatal
- Over pressure limit : 290 mmHg, Adult/Pediatric
- Over pressure limit : 145 mmHg, Neonatal
- Cycle Times
  Deflation time (typical): 30 sec.; BP time-out: 60 - 180 sec.
- Measurement Ranges, Adult (in mmHg)
  Systolic: 30 to 255; Diastolic: 15 to 220; Mean: 20 to 235
- Measurement Ranges, Neonatal (in mmHg)
  Systolic: 30 to 135; Diastolic: 15 to 110; Mean: 20-125
- Pressure: Transducer Accuracy ±3 mmHg or ±2%, whichever is greater
- Heart Rate:
  - ◊ Adult/Pediatric: 30 to 240 BPM
  - ◊ Neonatal: 40 to 240 BPM
- Modes: Auto, Manual, STAT
- Automatic intervals 1,2,3,4,5,10,15,20,30,60,120,180,240,360, 480 minutes
- Data Storage: Measurement time markers, S/D/M, Alarm event markers

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We follow every beat of your heart

Temperature

- YSI 400 Series Probes
- Body temperature: 0^0C to 45^0C (32^0F to 113^0F) +/- 0.1 ^{0}C
- Temperature Alarm Range: 25^0C to 45^0C (77^0F to 113^0F)
- Data storage: Temperature and Delta temperature, Temperature alarms

Delta Temperature

- Range + / - 45 ^{0}C
- Delta temp Accuracy: +/- 0.1 ^{0}C

End Tidal CO2 Microstream (EtCO2) Module

- Sidestream method
- Flow rate: 50 ml/min (accuracy: -7.5ml/min + 15ml/min)
- Displayed Data:
  - ◊ Waveform labels and annotations
  - ◊ EtCO2, in CO2 and respiration rate values
- CO2 Display Range: 0-99 mmHg
- Measurement Resolution: Typical Accuracy
  - ◊ ±2 mmHg for CO2 range of 0-38 mmHg
  - ◊ +0.08% for every 1 mmHg above 38 mmHg
  - ◊ ±5% for CO2 range of 39-99 mmHg
- Respiration Rate:
  - ◊ 0 to 70 bpm: ±1 bpm
  - ◊ 71 to 120 bpm: ±2 bpm
  - ◊ 121 to 150 bpm: ±3 bpm
- Rise Time: 190 msec (10% - 90%)
- Delay Time: 2.7 Sec (10% - 90%) typical
- Start-up Time: 30 sec typical
- Automatic Compensation: At least once per hour
- Ambient Temperature: 0-65°C,
  Humidity: 10-95%, non-condensing
- Barometric Pressure: 430-795 mmHg
  (-1250 to 15,000 ft. ; -380 to 5200 meter)
- Calibration required: Initially—after 1200 operating hours
  and then once a year or 4000 operating hours
- CO2 Alarm Limits: 0 to 100 mmHg; 0 to 10%; 0 to 15 kPa
- Respiration Rate Alarm Limits: Neonatal - 0 to 150 BMP; Adult - 0 to 50 BPM
- Data Storage:EtCO2, inCO2 and Respiration Rate values, Alarms, Apnea Alarm
- Exhaust Gas Outlet

BIS Interface

BISx Technology

- Bispectral Index (BIS): 0 to 100
  (0 = no brain activity, 100 = fully conscious)
- Electromyographic Strength (EMG):
  25 to 100 dB (where 1µV = 40dB)
- Signal Quality Index (SQI): 0 to 100%
- Suppression Ratio (SR): 0 to 100%
- Spectral Edge Frequency (SEF): 0.5 to 30.0 Hz
- Total Power (TP): 40 to 100 dB (1µV2 RMS = 40dB)
- Burst Count (BC): 0 to 30 (with an Extend Sensor only)
- EEG: Two channel, real-time EEG waveform
- Noise (EEG Waveform) < 0.3 µV RMS (2.0µV peak-to-peak)
- BIS Numeric Update Frequency: Once per second
- Band width: 0.25 to 100 Hz (- 3dB)
- Filters:
  - ◊ High Pass: 0.25, 1, 2 Hz
  - ◊ Low Pass: 30, 50, 70 Hz
  - ◊ Notch: 50 or 60 Hz
- Impedance Measurement Range: 0 to 999 kOhm
- Data Storage:
  - ◊ Numeric Chart
  - ◊ Graphic Trend and
  - ◊ EEG waveform full disclosure
  - ◊ CRG trend
- Display features:
  - ◊ EEG waveforms
  - ◊ EEG waveform + Trend of BIS and EMG
  - ◊ BIS value and alarm limit
  - ◊ EMG and SQI at vertical bars
  - ◊ SR, BC, TP numeric display
- Alarms:
  - ◊ High BIS alarm: 0–100
  - ◊ Low BIS alarm: 0–100

Anesthetic Gases Module

- Agent Gas External Module using Poet IQ bench technology
- with Automatic 5 Agent Identification .
- Size: (WxDxH) 264 x 208 x 96 mm / 10.4 x 8.2 x 3.8 in.
- Weight 3.4 kg / 7.5 lbs.
- Power: Input Voltage 100 to 240 Vac - 48 to 62 Hz
- Sampling Gas Flow Rate: 100 ml/min.
- Environment:
  - ◊ Temperature: +15 to +35°C / +59 to 95°F
  - ◊ Humidity: 15 to 95% RH (non-condensing)
  - ◊ Barometric Pressure / Altitude: 525mmHg to 790mmHg
  - ◊ -300m to + 3,000m (-1,000 ft – 10,000 ft)

Gas Specifications

Gas	Range	Accuracy (1-30 BPM)
CO2	0.0 to 30mmHg 30.1 to 76mmHg	± 1.5mmHg 5% Relative
O2 - fast	0.0 to 100.0%	±2.5% abs. plus 2.5% rel.
Breath Rate	0 to 100bpm	± 2bpm
N2O	0.0 to 100%	± 1.5% abs. plus 5% rel.
Isoflurene	0.00 to 7.5%	± 0.1% abs. plus 4% rel
Halothane	0.00 to 7.5%	± 0.1% abs. plus 4% rel
Enflurane	0.00 to 7.5%	± 0.1% abs. plus 4% rel
Sevoflurane	0.00 to 9%	± 0.1% abs. plus 4% rel
Desflurane	0.00 to 20%	± 0.1% abs. plus 4% rel.
MAC	Calculated from N2O + Agent	

Spirometry Module

- LED for function indication
- For use for patients with tidal volumes greater than 100 ml.
- Waveforms:
  - ◊ Air Flow
  - ◊ Air Volume
  - ◊ Airway Pressure
- Loops:
  - ◊ Flow Volume
  - ◊ Pressure Volume
  - ◊ Flow Pressure

Spirometry Measured Parameters

- RR - Respiration Rate
- VT - Tidal Volume
- MV - Minute Volume
- PIP - Peak Inspiration Pressure
- MAP - Mean Airway Pressure
- PEEP - Positive End Expiratory Pressure
- RES - Resistance
- COMP - Compliance
- PLTP - Plateau Pressure

EZ-Flow TM Flow Airway Adapter Specifications

- Flow Range: 2 - 180 lpm (33 - 3000 ml/s)
- Accuracy: ±5% reading, or 0.5 lpm
- Dead Space: 6.9 ml
- Flow (L/min):
  - ◊ Range: Adult 2.0 to 180
  - ◊ Accuracy: Greater of 0.5 LPM or ±3% of reading
- Tidal Volume (ml)
  - ◊ Range: Adult 200 to 3000
  - ◊ Resolution: Adult 1 ml
  - ◊ Volume Accuracy: Greater of ±10 ml or ±3% of reading
- Respiration Rate (breaths/min)
  - ◊ Range: Adult 2 to 120
  - ◊ Accuracy: Adult ±1
- Airway Pressure (cm H2O)
  - ◊ Range: Adult -120 to 120
  - ◊ Resolution: Adult 0.1 cm H2O
  - ◊ Accuracy: Adult ±2% of reading

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We follow every beat of your heart

CerebraLogik
Specification

The CerebraLogik is a dual channel EEG amplifier, with Amplitude Integrated EEG (aEEG) recording and display capability. It is used as a front end EEG amplifier interfaced to Menntor X7 Monitors, where EEG and aEEG can be displayed and stored, simultaneously with all patient vital signs monitored on the Menntor X7.

CerebraLogik Module

CerebraLogik interface to Menntor X7 with Monitor mass storage: 16GB

Physical

- HxWxD: 140/95/30 mm (5.5/3.7/1.2 inch)
- Weight: 385gr (0.849 lb) (with mounting clip and cable)
- Interface Cable length: 1.2meter (47.2 inch)
- 5 sockets for DIN safety electrodes cables
- Power Consumption: 5V/300 mA
- Mounting Clip

Amplifier

- 2 different amplifiers: Left, Right + Reference.
- Input Range +/400 µV p-p full scale
- Input impedance > 5 MΩ
- Linearity ±2%
- DC input offset: +/- 2500 mV maximum
- Common Mode Rejection Ratio 130 dB at 50/60 Hz
- Frequency Response 0.5 Hz to 75 Hz (-3db)
- Noise < 10nV/ sqrt(Hz) at 100Hz
- Bias Current: Less than 7nA per input
- Input isolation – Double isolation

A/D

- Sampling rate: 640 Hz per channel
- A/D span: 24 bits
- Low filter (High pass) 0.5/1.5 Hz
- High filter (Low pass) 15/35/50/70 Hz
- Degree of protection: Type BF Applied part

aEEG Monitoring Parameters

- 2 x Differential channel (Left, Right): EEG/aEEG channels
- 1 Cross Channels ("Left – Right") : EEG/aEEG
- Signal Quality (Resistance) - 0 to 5 (Arbitrary units)
- EEG Gain: 10,20,50,70,100,200 µV/cm;
- aEEG Range: 100, 200µV
- EEG/aEEG history duration: Up to 7 days recording
- aEEG panel : 3 Hour Display
- EEG sweep speed : 15 or 30 mm/Sec
- Section marking
- Event marking
- Built-in Recorder (Optional)

Data Export

- Data printing on recorder (Optional)
- USB for Data output (viewer on PC)

Environmental Operating Conditions

- Temperature: +5^{0}C to +40^{0}C (41°F to 104°F)
- Humidity: 10 to 93 percent, non-condensing

Environmental Storage Conditions

- Temperature: -15C^{O} to +68C^{O} (5°F to 154°F)
- Humidity: 10 to 93 percent, non-condensing

Regulatory

- Degree of protection: Type BF Applied part
- EN 60601-1
- EN 60601-1-2 (EMC)
- 60601-2-26 (EEG)
- CE Mark 0473

CHAPTER 4:
INSTALLATION AND SETUP

Unpacking and Inspection

Before unpacking the ***Menntor X7*** bedside monitor, the packaging should be visually inspected for any signs of damage or abuse which may have resulted during shipment. If any signs of external damage are visible, you should contact your nearest Mennen Medical agent before proceeding to unpack the unit. Failure to do so could invalidate the warranty.

During unpacking, each item should be unpacked carefully and should be visually inspected for any signs of damage which may have resulted during shipment. All components should be checked against the packing list to confirm their availability. Should any damage be apparent or any part found missing, contact your Mennen Medical agent immediately. Do not attempt to set up the system if any damage to a component is apparent.

Setting Up the System

The Menntor X7 is a modular monitor with integrated display and optional recorder.

The basic system consists of the host monitor, the Multi Parameter Module (MPM) and optional EtCO2 and Spirometry modules.

It is supplied with accessories according to the invasive or non-invasive model. The monitor can be placed either on top of a shelf, on a mobile cart, or on a wall mount. A variety of different types of wall mounts can be used. Select the wall mount or cart according to your hospital's individual requirements. Wall mounts obtained from Mennen Medical are supplied with detailed instructions.

Installation Procedures

Proper installation of the ***Menntor X7*** is divided into three phases: Site survey, physically mounting the monitor and cable interconnection. If your hospital has

special installation requirements, these may call for special planning and materials that must be furnished by your hospital and are not covered by this manual.

Site Survey

Performing a site survey ensures that all environmental, electrical, and cabling requirements are taken into consideration. This ensures that the actual installation proceeds as smoothly as possible and that the installed equipment will run reliably.

A site survey should be performed every time an ***Menntor X7*** bedside monitor is installed. The hospital Biomedical Engineer and Facilities Engineer should participate in any discussion which must include:

- Reviewing details and drawings of hospital layout and architecture.
- Planning of all cable ducts, raceways, runs, wall plates, pull boxes and other interconnection details.
- Establishing length of cable runs.
- Reviewing AC power requirements, locations and types of outlets.
- Discussing the type of emergency (backup) AC power supply to be used, time of transfer (periodic test), degree of transient introduced into the power line (how long is power interrupted?), frequency and voltage of emergency power.
- Reviewing environmental considerations, such as ambient temperature, humidity control, potential static charge, and expected tolerances in the area planned for the ***Menntor X7***.

Measure AC power disturbances over a period of at least 24 hours with a power line analyzer. It is important to perform this test over the period of emergency power transfer to measure the severity of transients during the transfer.

Environmental Requirements

The location selected for the ***Menntor X7*** should be out of direct sunlight and in a clean-air atmosphere. Avoid dusty areas or areas where there are airborne dirt particles. Avoid static build-up and discharge which may result in disruptions of operation and loss of data.

Reasonable environmental parameters are:

- Temperature: 5° to 40° C (41° to 104° F)
- Relative Humidity: 10% to 93% (non-condensing)

Note: *See “System Specifications” on page 3-7 for environment limits.*

Wall Mounting Instructions

To properly mount your ***Menntor X7*** bedside monitor, refer to the wall mounting instructions supplied with your wall mounting kit. It is the responsibility of the hospital, its consultants, and/or contractors to determine that the wall is adequate to safely mount instrumentation. This includes the selection of appropriate fasteners and the proper installation of the same.

Cable Interconnection

Connect the power cable to a hospital-grade power outlet.

Grounding the System

To protect the patient and hospital personnel, the ***Menntor X7*** system must be grounded. Accordingly, the system is equipped with a detachable 3–wire cable which grounds the instrument to the power line ground (protective earth) when plugged into an appropriate 3–wire receptacle. If a 3–wire receptacle is not available, consult the hospital electrician.

WARNING!!!: *Do not use a 3–wire to 2–wire adapter with this instrument.*

If the monitor is connected to another device make sure that both are connected to an equipotential grounding terminal

WARNING!!!: *If it is not evident from the instrument specifications whether a particular instrument combination is hazardous or not, for example due to summation of leakage currents, the user should consult the manufacturers concerned or an expert in the field to ensure that the necessary safety of all instruments concerned will not be impaired by the combination.*

Equipotential Grounding

Protection class 1 instruments are already included in the protective grounding (protective earth) system of the room by way of grounding contacts in the power plug.

Check each time before use that the instrument is in perfect working order. The cable connecting the patient to the instrument must be dry and clean.

CAUTION! *When performing examinations in or on the heart (or brain), the conductive parts of electrodes and associated connectors, including the neutral electrode, should not contact other conductive parts including earth.*

Electrosurgery, Diathermy and Defibrillation Protection

Neither electrosurgery and diathermy instruments nor defibrillation will damage the monitor. If the correct electrodes are used and applied according to the manufacturer's instructions, the screen display will recover within 5 seconds of defibrillation or RF interference. The inputs are floating and are defibrillator-proof. For most efficient monitoring when electrosurgery is in use, see "Minimizing Electrosurgical Interference" in "Warnings and Precautions".

WARNING!!!: *DO NOT TOUCH THE PATIENT, BED OR INSTRUMENT DURING DEFIBRILLATION.*

Accidental Wetting of the Equipment

If, for whatever reason, the equipment accidentally gets wet, remove all patient connections and turn the unit off. Thoroughly wipe all wet areas and then allow sufficient time to ensure that the equipment is completely dry before proceeding.

Patient Connections

All patient connections on the ***Menntor X7*** Vital Signs have special keys to prevent user error.

CAUTION! *The rear panels of the Processor have no patient connections.*

Recommended Setup for Neonatal Applications

The following setup is recommended for Neonatal. Setup for Neonatal should be entered via the System Setup. This should be performed by the System Administrator or requested as a Factory Setup.

Table 4-1: Recommended Setup Parameters

Parameters	*Low Alarm*	*High Alarm*	*Display*
ECG	100	200	Waveform - 1 lead
Respiration	30	100	Waveform
Apnea	20 sec		In Respiration
NIBP Sys/Dia/M	50/20/20 mmHg	90/60/70	Big Numbers
BP-Art Sys/Dia/M	50/20/30 mmHg	90/60/70	Wavefrom - option
BP-PAP Sys/Dia/M	24/-4/12 mmHg	60/4/26	Waveform -option
BP-CVP Mean	2	10	Waveform -option
BP-ICP Mean	2	10	Waveform -option

Table 4-1: Recommended Setup Parameters

Parameters	*Low Alarm*	*High Alarm*	*Display*
SpO2	80%	95%	Waveform -option
EtCO2	35 mmHg	45 mmHg	Waveform -option
Temperature	36.0 C (96.8 F)	39.0 C (102.2 F)	Big Numbers - T1
TcpO2 / TcpCO2	60/35 mmHg	90/45 mmHg	Big Numbers - Opt
Recommended Display Options for CRG			CRG1 = HRT, Resp
			CRG 2 = SpO2, BP

Note: *Optimal parameters will be included in Neonatal Admit key only if they are included in Neonatal Admit key and only if they are included in the purchased monitor configuration.*

Height: Select cm or inch

Weight: Select gram or ounce

CHAPTER 5:
MAINTENANCE AND CLEANING

Cleaning the Menntor X7 Bedside Monitor

The Menntor X7 bedside monitor can be cleaned with most common hospital cleaning solutions and detergents. Be careful not to use caustic detergents or ammonia or acetone-based cleaning solutions. These may damage the bedside monitor.

➤ ***To clean the Menntor X7 bedside monitor and accessories:***

1. Switch the monitor off and disconnect from the power supply before cleaning.
2. Dust the monitor regularly. Clean with a lint-free cloth or sponge dampened with cleaning solution. Abrasive scouring powders and pads should be avoided to prevent damage to the monitor.
3. Clean the display screen with non-abrasive glass cleaners, such as “Ajax” or “Windex”. Use a lint-free cloth. A paper towel may damage the screen.

   Before cleaning a Touch Screen disable the Touch functionality. To disable Touch enter System Setup (password protected) and press the "Touch Screen" key. At the end of the cleaning re-activate the Touch functionality.
4. Clean patient cables and all exposed surfaces with mild soap solution only. Using alcohol or any type of concentrated cleaning solution may impair patient cable flexibility.
5. Remove any adhesive used to attach the cable to the patient. To remove adhesive residue, use a plaster remover solution made up of one-third alcohol, two-thirds water, or use a commercial tape remover such as Scholl Double Seal tape remover. Do not use strong solvents (acetone, straight alcohol, ammonia, etc.). These will damage the cable.
6. Do not autoclave patient leads, transducer components or other sensors. Autoclaving permanently damages these instruments. If you need to sterilize accessories, we recommend EtO gas sterilization.

Calibration and Preventive Maintenance

Daily : Check interface cables and accessories for deterioration.

Clean interface cables and accessories with fine lint soaked with mild detergent.

CAUTION! *Do not use any cable if it shows signs of deterioration*

Annualy: Once every year perform a full monitor test, according to the Menntor X7 field test procedure (see Appendix F "Test Procedure").

It is recommended that the Menntor X7 is checked at least once a year by qualified Mennen Medical personnel for proper calibration of the unit.

The exterior of the unit should be periodically checked for any signs of damage or abuse. Units or parts which show any signs of damage should be immediately referred to a qualified technician.

Before commencing monitoring on a patient:

- check for any mechanical damage.
- check all external leads and accessories.
- check all functions of the instrument needed to monitor the patient and ensure that the instrument is in good working order.

Do not use the ***Menntor X7*** for any monitoring procedure on a patient if you identify features which demonstrate impaired functioning on the instrument. Contact the hospital biomedical engineer, or Mennen Medical service engineer.

Full performance checks, including safety checks, must be performed by qualified service personnel at least once a year and after every repair.

The synchronization of the monitor and defibrillator should be checked as often as required by the Hospital Procedures Policy, and must be tested at least every three months by qualified service personnel.

The grounding and equipotential resistances of the monitor and power cables must be tested at least every 3 months.

All checks which require the instrument to be opened must be made by qualified service personnel. Safety and maintenance checks can also be made by Mennen Medical personnel. Your local Mennen Medical agent will be glad to give you information about service contracts.

Battery Conditioning

To ensure long battery life , condition the battery every three (3) months.

➤ ***To condition the battery in the monitor:***

1. Check the battery indicators (see Figure 6-3:) to confirm that the batteries are fully charged.
2. Disconnect the monitor from the AC mains and let the monitor work on battery for at least 2.5 hours or until the battery is fully discharged and the monitor switches itself off.
3. Connect the monitor back to the AC mains and wait for the battery to be fully charged.

Equipment End of life

CAUTION! *Disposal of old equipment that is out of service, must take into account the environmental requirement according to the regulations of the user country.*

Take special care when disposing of batteries.

CHAPTER 6:
CONTROLS AND FUNCTIONS

Power On

The main power switch is located on the left side of the front panel. Turn on to supply power to all the components.

Power Off - Shutdown

Use the Shutdown procedure to turn off the power. Select the Setup menu and then select Shutdown. A warning panel called Shutdown appears:

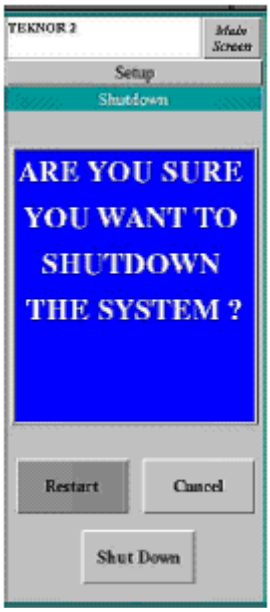


Figure 6-1: Shutdown Panel

You have the following options:

- Press **Cancel** to return to the main screen.
- Press **Restart** to reset the monitor without power off.

- Press **Shutdown**: A gray screen appears.
  Wait for the message: **Shutdown - System may now be powered down** and switch off the power.

AC Operation

The ***Menntor X7*** operates on 115 or 230 VAC line power at 50 - 60 Hz or on battery. Before connecting the unit to the AC line, check the identification label on the rear panel of the unit for the appropriate line voltage and frequency. The ***Menntor X7*** is supplied with a three-wire AC line power cord with ground pin. The safety features of the product require that it be connected to a primary power distribution system which provides adequate grounding. Installation and maintenance must be performed in accordance with Mennen Medical specifications.

Power Interruptions

In the case of a power failure, the monitor will automatically convert to battery power. The ***Menntor X7*** will work on battery power for up to 3 hours (6 hours with optional dual battery). If power is switched off the system retains the parameter setup for the monitored patient. When power is restored, Menntor X7 resumes monitoring according to the patient's setup.

Alarm Limits and Alarm Response are restored automatically.

Note: *All stored data (Chart, trend, Full disclosure and alarm notes) are recovered after power interrupts.*

Note: *Check all monitor settings after any power off.*

Main Screen Display Features

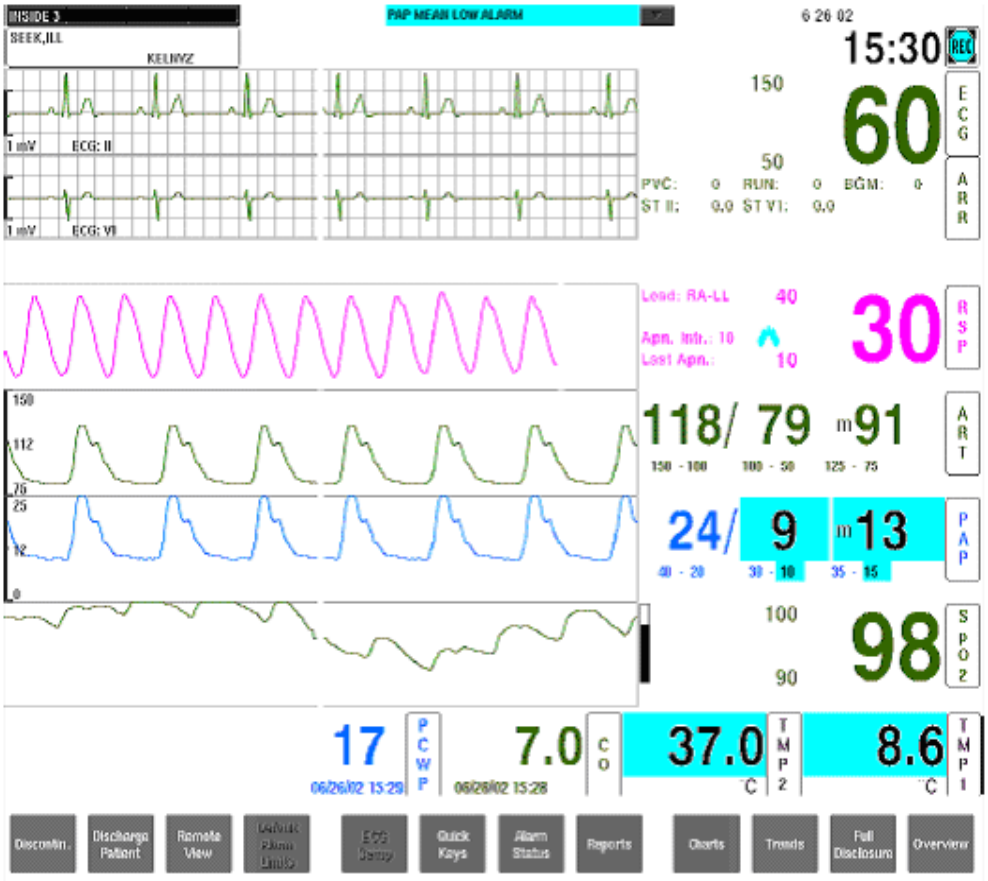


Figure 6-2: Main Screen Display

The main screen display is divided into four areas:

- Global Header
- Patient
- Patient Display
- QuicKeys™

Global Header Area

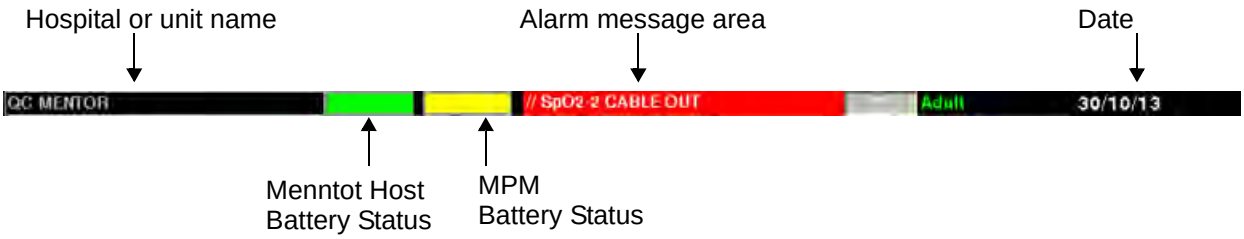


Figure 6-3: Global Header Area

The Global Header runs along the top of the screen and contains the following information:

- Hospital or unit name, located on the left.
- "Battery Status" bars. Green for the Menntor host battery and Yellow for the MPM battery

CAUTION! *To ensure battery life, service the battery every three months (see "Battery Conditioning" on page 5-3 for battery conditioning procedure).*

- Alarm message area, located in the center. For a list of all alarm messages, see "Alarm Messages" on page 8-12.
- Current date and time, located on the right.

Patient Area

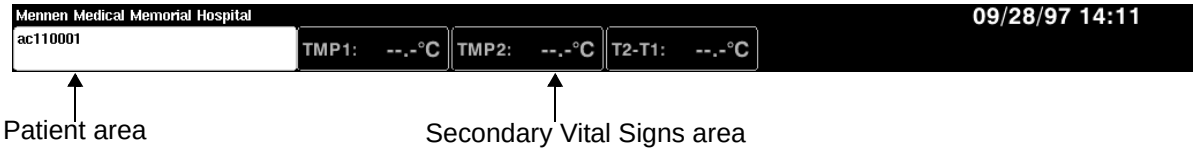


Figure 6-4: Patient Area

The Patient area is located directly below the alarm message area and includes:

- Demographic Data Area
- Secondary Vital Signs Area
- Icons

Demographic Data Area

The patient's personal information is displayed here. The area also functions as an on-screen key, enabling access of the Patient Identification panel where relevant patient information can be entered or changed.

Secondary Vital Signs Area

Monitored vital signs are displayed as numeric values in this area. A vital sign may be displayed here for one of the following reasons:

- It was configured to be displayed without an associated waveform because it was considered to have lower priority than other monitored vital signs.
- It was configured to be displayed in waveform format but was relegated to Secondary Vital Sign status due to lack of display space.

Each monitored vital sign has an on-screen key that can be used to access the specific vital sign's menu. Displayed vital sign information includes the vital sign's name, value, and the measurement units (if configured). You can configure how format values are displayed.

Speaker Icon

A Speaker icon appears in the upper left corner of the patient area and displays the status of the speaker. It indicates whether the audible alarm is on or off.

Main Display Area

Vital sign waveforms and other information are displayed here. Each monitored vital sign appears in a parameter slot. A parameter slot is the area on the screen set aside for displaying the waveform and data of a specific vital sign. The size of the parameter slot is configurable and depends on the system operation mode and the number of vital signs being monitored.

Each parameter slot contains:

- Waveform area
- Primary vital sign area
- Parameter key

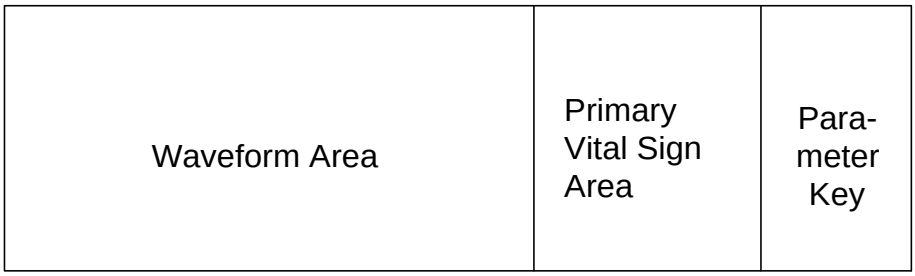


Figure 6-5: Typical Parameter Slot

Parameter Key

The parameter key displays the name of the monitored vital sign. The key functions as an on-screen button. When pressed, it accesses the relevant parameter menu.

The ECG slot is generally larger than non-ECG slots, permitting more than one parameter key to be displayed in the same slot. These keys include Arrhythmia and ST Segment Analysis and they provide quick access to the relevant menus.

The following table presents the vitals signs that the ***Menntor X7*** can monitor, including the abbreviations used to identify them on the parameter keys:

Vital Sign	***Abbreviation***
Arrhythmia	ARRY
Arterial Pressure	ART
Cardiac Output	CO
Central Venous Pressure	CVP
Electrocardiogram	ECG
End Tidal CO_2	EtCO2
Left Atrial Pressure	LAP
Left Ventricular Pressure	LVP
Non-Invasive Blood Pressure	NIBP
O_2 Saturation	SpO2
Pulmonary Artery Pressure	PAP
Respiration	RSP
Right Atrial Pressure	RAP
Right Ventricular Pressure	RVP
ST Segment Analysis	ST

Vital Sign	*Abbreviation*
Temperature	TMP X
Temperature Difference	TX -TY
Unnamed Pressure	PRX

Primary Vital Sign Area

The Primary vital sign area appears to the right of the parameter key. You can see the numeric values associated with the monitored vital sign in this area. The most common values displayed are:

- Parameter numeric value
- Sub-parameters values
- Measurement units
- Alarm limits

For certain vital signs, this area may display special information such as:

- Heartbeat symbol
- Plethysmograph indications
- Timer indicating when the next measurement is due
- Date and time stamps for periodic measurements

The values that appear for each vital sign are described in the section devoted to the individual vital sign.

Extended Primary Vital Sign Area

When the height of the parameter slot is more than the minimum (30mm for ECG, 20mm for non-ECG parameters), the extra space created is called the Extended Primary Vital Sign Area. This space is used to display additional information, such as sub-parameters, calculated values, etc.

Waveform Area

In this area, waveforms and waveform-related data is displayed. Up to eight waveforms can be displayed. The display area for ECG waveforms is larger than that allocated to non-ECG vital signs. This allows the ***Menntor X7*** to display more than one ECG waveform.

In special cases, other continuous data display formats, such as charts or trends, can be presented in this area.

Big Numbers Feature

The Big Numbers display option is an intermediate level between the waveform display and the Secondary Vital Sign display. When Big Numbers is selected, the parameter appears in the Primary Vital Sign area without the waveform. The value appears much larger and more apparent to the viewer than values displayed in the Secondary Vital Sign area.

QuicKeys™ Bar

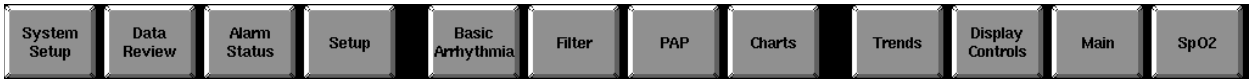


Figure 6-6: QuicKeys™ Bar

The QuicKeys™ bar is a row of up to 12 user-defined function keys that appear on the bottom of the main screen display. QuicKeys™ provide quick access to your most frequently used functions. For example, if you want to access the Charts panel, instead of going through the Main menu to the Patient Data menu and then selecting Charts from the Patient Data menu, you can simply turn the QuicKnob™ until the Charts QuicKeys™ is highlighted and press to display the Charts panel.

Any function can be configured as a QuickKey.™ QuicKeys™ are configured by your hospital biomedical engineer or System Administrator in System Configuration.

Note: *Quick Keys disappear from the screen every two minutes. To redisplay the QuicKeys™, simply turn the QuicKnob™.*

Main Processing Unit

All clinical data collected from the inputs are stored in the main processing unit. This data includes waveforms, vital signs, trends, charts and beat-to-beat data.

The main processing unit can store at least ten days' worth of patient data for review purposes.

Front Panel

The front panel has seven fixed keys and the QuicKnob™. These features provide the means by which you interact with the ***Menntor X7***.

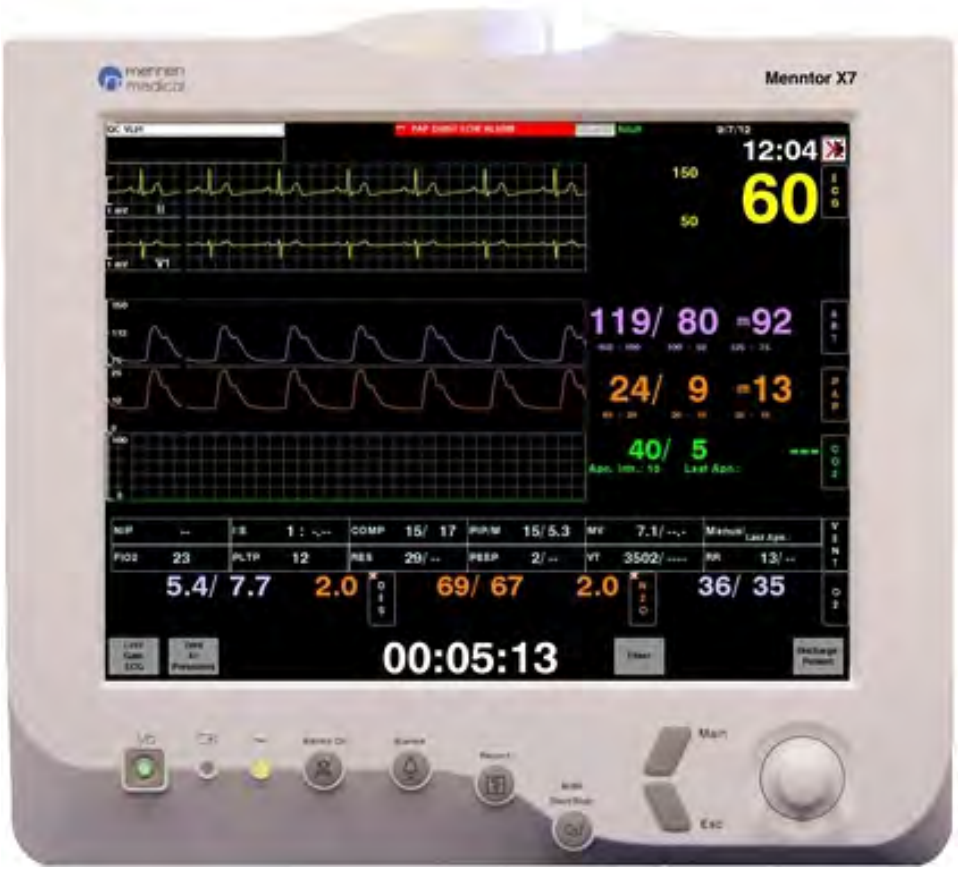


Figure 6-7: Front Panel of the Menntor X7

Fixed Keys

Menntor X7 fixed keys are marked by icons and label.

Table 6-1: Menntor X7 Fixed Keys

Fixed Keys	*Icon*	*Function*
Alarm Off		Pressing Alarm off disable all alarms for a predefined period
Silence		Pressing the Silence key disables any active alarm tones for a pre-defined period of 60 seconds. The alarm condition still exists and visual indication of the alarm remains on screen. If a new alarm is triggered during the silence period, the Silence function is cancelled.
Record		Pressing Record will send recording to the inbuilt strip chart recorder . If the Menntor X7 is not equipped with inbuilt recorder the recording will be sent to the network Enscribe strip chart recorder.

Table 6-1: Menntor X7 Fixed Keys

Fixed Keys	*Icon*	*Function*
NIBP Start Stop		***Note:*** *Pressing NIBP starts/stops NIBP measurement .*

Escape

When a panel or menu is open, pressing **Escape** allows you to:

1. Exit an open list box without implementing any changes.
2. Exit a panel without implementing any changes.
3. When you are in a menu or in an open box, use the **Escape** button to return to the previous step or to the previous menu.

Note: *This does not apply to panels in which changes are implemented immediately, such as Alarm Settings.*

4. Escape will bring the focus to the Monitor Name box (Top, Left)

   Press to get the Main Menu.

   This Menu will include:

   - Patient Data
   - Vital Signs
   - Setup
   - Utilities

   Open **Utilities** to show a menu of HW key function that can be used to active the functions or to create QuicKeys™:

   - Record
   - Timer
   - All Alarms Off
   - Silence
   - Freeze

Main Screen

Pressing the Main Screen key saves changes made on open panels, closes the panels and returns you to the main screen display.

QuicKnob™

The QuicKnob™ permits you to interact with the display screen, menus and dialog panels. Turn the QuicKnob™ clockwise or counterclockwise to move through all areas of the main screen display, menus and dialog panels. As you pass through an area, it is highlighted. When you reach a required area, press the QuicKnob™ to select it.

For example, if you have begun monitoring a patient but you haven't yet completed entering his demographic data, turn the QuicKnob™ until you highlight the demographic area on the screen and press. The Patient Identification panel is displayed. Turn and press the QuicKnob™ to fill out each area on the panel. When you have finished, turn the QuicKnob™ until you highlight the "Main Screen" button. Press the QuicKnob™ to implement your changes and close the panel.

Note: *The QuicKnob™ is also used to set values on a scale such as when setting alarm limits using the slider bar in the Alarms panel. In this case, turning the knob clockwise or counterclockwise increases or decreases the value by units of five or ten. Turning the knob clockwise or counterclockwise while pressing results in an increase or decrease in single units.*

QuicKnob™ Conventions

The following terminology is used when describing QuicKnob™ procedures:

Select	Used when: • Accessing a drop-down list indicated by an arrow. Turn the QuicKnob™ until the required area is highlighted and press. • Selecting an option from a list where only one option can be selected. These lists are indicated by diamond-shaped option buttons. • Activating or deactivating a checkbox. Green indicates that the checkbox is turned on (activated), gray indicates that the checkbox is turned off (deactivated). Turn the QuicKnob™ until the required area is highlighted and press.
Press	Used when pushing an on-screen button. Turn the QuicKnob™ until the required area is highlighted and press.

Back Panel Connectors

- Three-wire AC input that connects to hospital-grade power supply outlet.
- Fuse x 2: Fuse assembly, under the power cable.

WARNING!!! *Plug assembly power cable must be disconnected to access fuses.*

- Remote control socket
- Auxiliary socket

Right Panel Connectors

- **ISO LAN**: Isolated LAN (5000V), main LAN output
- **RGB**: Output for external display
- **PS-2**: Mouse / keyboard
- **USB**
- **Compact Flash**

Working With Menus and Panels

Types of Menus and Panels

A series of interactive panels enables you to enter data into the ***Menntor X7***. The ***Menntor X7*** works with four panel types:

- Vertical
- Horizontal
- Full
- Keyboard

A description of each type of panel follows. For a description of common panel features, see “Common Panel Features” on page 6-15.

Vertical Panels

When you select a function from a menu or press a UDK or select an on-screen button, a dialog panel opens. In some cases. this panel is a vertical. Menu panels and vital sign panels are vertical panels. A vertical panel appears on the right side of the screen above the UDKs.

The following table identifies common features of vertical panels and their locations.

Feature	*Location*
Back Menu Button	Top of panel
Menu Title	Top of panel, directly below Back Menu button
Drop-down menu	Left of panel, below Menu Title area
Main Screen Button	Right corner, to the right of the drop-down menu

Horizontal Panels

When you select a function from a menu, press a UDK or select an on-screen button, a dialog panel opens. In some cases this panel is a horizontal. Charts and Trends are examples of horizontal panels. Vertical panels cover the lower central area of the screen without affecting the main display area.

The following table identifies common features of horizontal panels and their locations.

Feature	*Location*
Back Menu Button	Top left of panel
Menu Title	To the right of the Back Menu button
Drop-down menu list	To the right of the Menu Title area
Main Screen Button	top right corner of the panel

Full Panels

A full panel appears when a function needs more screen space that either a horizontal or vertical panel can provide. It covers the main display area, leaving the area containing the global header, the Secondary Vital Signs area and the top ECG waveform visible.

The following table identifies common features and their locations:

Feature	*Location*
Back Menu Button	top left corner of panel
Menu Title	to the right of the Back Menu Button
Drop-down menu list	to the right of the Menu Title area
Main Screen Button	top right corner of the panel

Keyboard Panels

The keyboard panel is a special type of horizontal panel that appears when you select a text box that entails some kind of alphanumeric input (e.g., the patient name text box in the Patient Identification Panel).

The following table identifies common keyboard features and their locations.

Feature	*Description*	*Location*
Letter buttons (a-z)	letters a-z	top left area of panel
Number buttons (0-9)	numbers 0-9	top right area of panel
Commonly used symbols	Includes symbols such as “/” or “-”	in the letter or number area
Capital Letters	When pressed, letters are in capitals	below the numbers
Clear	Clears the text box	center of panel, below letter buttons
Undo Last Key	Clears the last input character	below the letters, to the left
Accept	Saves input changes and closed panel	bottom right corner of panel
Cancel Changes	Closes panel without implementing changes	to the left of the Accept button
Two text boxes	One for the name of the field being changed. One for the field itself.	bottom left of panel

Moving Between Panels

Move between panels by:

- Selecting navigational keys in the panel that allow you to move to a higher level panel or to access another panel on the same level.
- Exiting the panel and returning to the main screen display. You can then select a new panel by using the on-screen buttons or via the Main menu. Use the QuicKnob™ to access the box above the ADT box (top left) and open the Main menu.

Common Panel Features

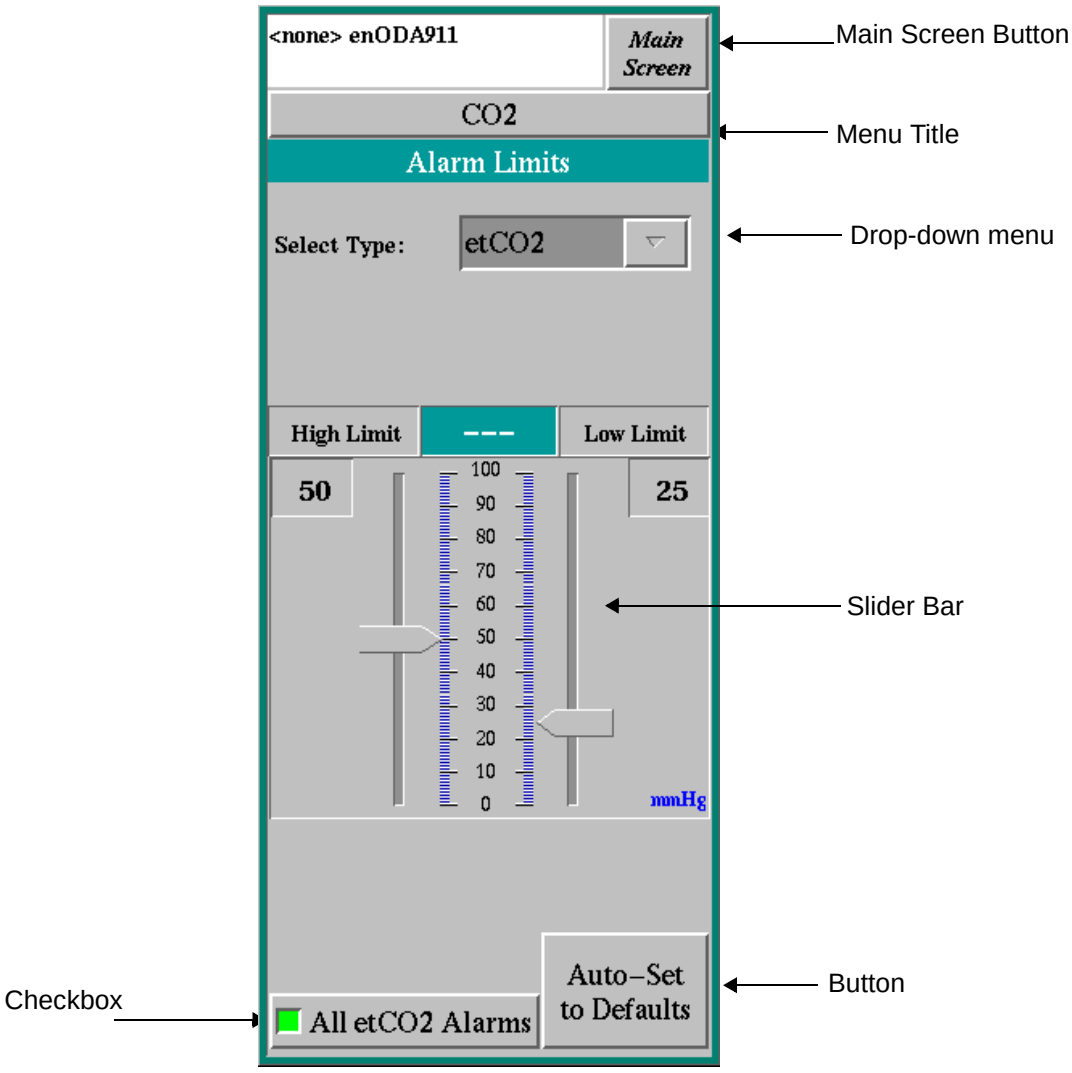


Figure 6-8: An Example of a Dialog Panel

Each panel (except keyboard panels) shares the following common features:

- **Main screen button** - Implements any changes made and exits the panel. The panel closes and the standard main screen display appears.
- **Menu title** - Displays the name of the menu to which the panel belongs.
- **Drop-down menu** - Contains a list of panels you can access. The selected panel is the current panel.
- **Print** - prints data. Does not appear on all panels.

Other Panel Features

The following features enable you to interact with the panel:

- **Buttons** - Press a button to perform a specific function. For example, press the Discard Changes button to close the panel without implementing any changes that might have been made.
- **Labels** - Text displayed on the panel. The text labels active areas such as choice lists or drop-down menus.
- **Checkboxes** - Used to turn an option on and off (enable/disable). If the checkbox appears green, the option is enabled. If the checkbox appears gray, the option is disabled.
- **Option Buttons** - Used to select an option from a group of mutually exclusive options. When you select an option button, it appears green. The unselected buttons appear gray.
- **Data Entry Controls** - When you select this feature, a keyboard panel opens enabling you to type in the required data.
- **Slider Bars** - Move the indicator along a bar graph to pick a number, time or event.
- **Drop-down lists** - Presents a list of choices. If the list is too long to be displayed in the available space, a scroll bar appears to enable you to scroll through the list.

Accessing Menus and Panels

From the Main Display

Icons

The icon located in the upper right corner of the patient area reflects the status of various hardware devices connected with the Menntor X7.

Speaker Off Icon

If Alarm volume is set to **Off** or if **All Alarm Off** button if pressed the icon will show a loudspeaker with an X .

Recorder Status Icon

If recordings are sent to the Strip chart recorder and the recorder is not ready or out of paper, a recorder icon will appear in the icon area.

CAUTION! *When the recorder returns to work, all the stacked recordings will be recorded sequentially and a lot of recording paper will be wasted.*
In such case it is recommended to "Delete All Recordings" by using the relevant key in "Patient Data"

Check Printer Message

The message **CHECK PRINTER** appears, blinking, on the bottom row of the monitor if more than 22 prints were sent by a monitor to a printer that is not ready or out of paper.

Use the **Silence** key to delete the message.

CAUTION! *If a "Check Printer" message is received, use "Delete All Recordings" in "Patient Data" to first clear the stack of prints then check the printer to enable it to resume working.*

Patient ID Area

The Patient ID area is located at the top of the main screen display to the left of the speaker/recorder icon and functions as an on-screen key. Select the Patient ID area to access the Patient Identification panel

Parameter Keys

Parameter keys display the name of the vital sign being monitored. The key also functions as an on-screen button. Select a parameter key to access the relevant parameter menu.

QuicKeys™

If a QuicKey™ has been configured for a function, press on the QuicKey™ to display the relevant menu or dialog panel.

From the Main Menu

Vital Signs

Select Vital Signs to access the Vital Signs menu. The Vital Signs menu enables you to access the dialog panels of all monitored Vital Signs and to view the Alarm Status panel (see page 8- 9).

The Vital Signs menu displays the available vital signs supported by the ***Menntor X7***. The Vital Signs menu also displays inputs such as CO_2 / Temp.

The user can assign names to the Blood Pressures and Temperatures. For example, the unassigned BP is marked as follows: BP1 (Unassigned). This changes from

BP1 to ART when the user assigns the ART location to input 1. A "Zero All Pressure" key appears at the end of the vital signs list.

Figure 6-9: Vital Signs Menu

Setup

Select **Setup** to display the **Setup** menu panel. This menu panel gives you access to the following setup functions:

Table 6-2: Setup Functions

Function	*Page*	*Condition*
A-D-T (Admission; Discharge; Transfer)	**9- 1**	
Alarm Volume	**8- 7**	
Display Controls	**7- 2**	
CRG	**7- 6**	
Select Monitor Profile	**9- 20**	**System Setup**
Software Version	**3-18**	
Remote View	**10- 23**	
HemoCis View	**9- 16**	**Option**
Alarm Watch Setup	**7- 13**	**System Setup**
Shutdown	**6- 1**	
System Setup	**D- 1**	**Appendix D: Service Manual**

SECTION 2
PATIENT MONITORING PROCEDURES

This section contains the following chapters:

1. Chapter 7: Setting Up the Patient Display
2. Chapter 8: Alarms
3. Chapter 9: Connecting a Patient to Menntor X7
4. Chapter 10: Reviewing Patient Data
5. Chapter 11: Performing Clinical Calculations
6. Chapter 12: Performing Medication Calculations
7. Chapter 13: Recording Vital Sign Data

CHAPTER 7:
SETTING UP THE PATIENT DISPLAY

Admission Keys

Before you connect a patient to the Menntor X7 bedside monitor, the main screen display is in idle mode and all that appears on the monitor screen is the **Admit as Previous** key and some additional Monitor Profile Admission keys. Each Monitor Profile key contains the following information:

- Key name
- List of parameters to be monitored
- Settings for each of the parameters (alarm limits, colors, etc.)
- Screen format and the location of the monitored parameters on the main screen display.

The various Monitor Profile Admission keys enable you to quickly connect a patient and begin monitoring without having to define all the parameters at the time of admission.

You always have the option to configure monitoring and display parameters according to the requirement for each specific patient.

When you initially connect a patient to the bedside monitor, you can select either the available Monitor Profile admission keys, or **Admit as Previous**.

The Menntor X7 turns on the parameters of the selected profile and begins monitoring, automatically, setting the display according to the configurations defined in the selected Admission key.

Up to 10 Monitor Profile Admission keys can be configured for the monitor.

Note: *See “Monitor Profiles Setup” on page D-54 for details of creating Monitor Profiles.*

CAUTION! *To check the functioning of the alarm sound, note that the Sound Event upon admission is heard.*
See “Sound Event” on page D-17 for setting the sound volume.

Display Controls

The **Display Controls** panel allows you to control the way data is presented on the screen. In the Display Controls panel you can set the following:

- Sweep Speed
- Special Display Format

➤ ***To access the Display Controls panel:***

- From the Main menu select the **Setup** key, and select **Display Controls** from the **Setup** menu.

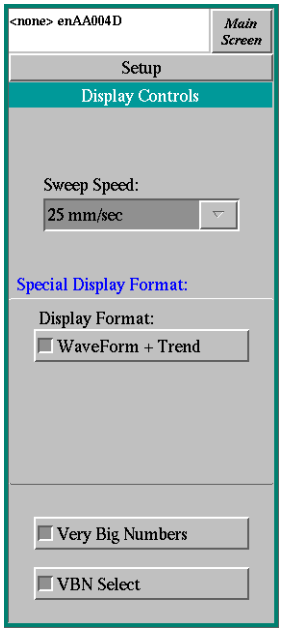


Figure 7-1 A: Display Controls Panel

Figure 7-1 B: Display Control Very Big Numbers

Adjusting Sweep Speed

The common sweep speed for all cardiovascular parameter waveforms can be set in the **Sweep Speed** box. **Sweep Speed** may be set to any of the following values: 6.25, 12.5, 25, 50, and 100 mm/sec. The system default speed is 25 mm/sec.

Note: *Respiration sweep speed is set separately in the* **Respiration Display Options** *panel.*

➤ ***To adjust sweep speed:***

1. In the **Display Controls** panel, under **Sweep Speed**, select from the list the required speed. The system default is 25 mm/sec.
2. Press **Setup** to return to the **Setup** menu
   –or–
   Press **Main Screen** to return to the main screen display.

Selecting a Special Display Format

Select one of the following display formats:

- **Waveforms and Trend Format** - displays waveforms and trended data in a "split-screen" format.
- **Regular Format** - the screen display is divided automatically according to the number of selected parameters.

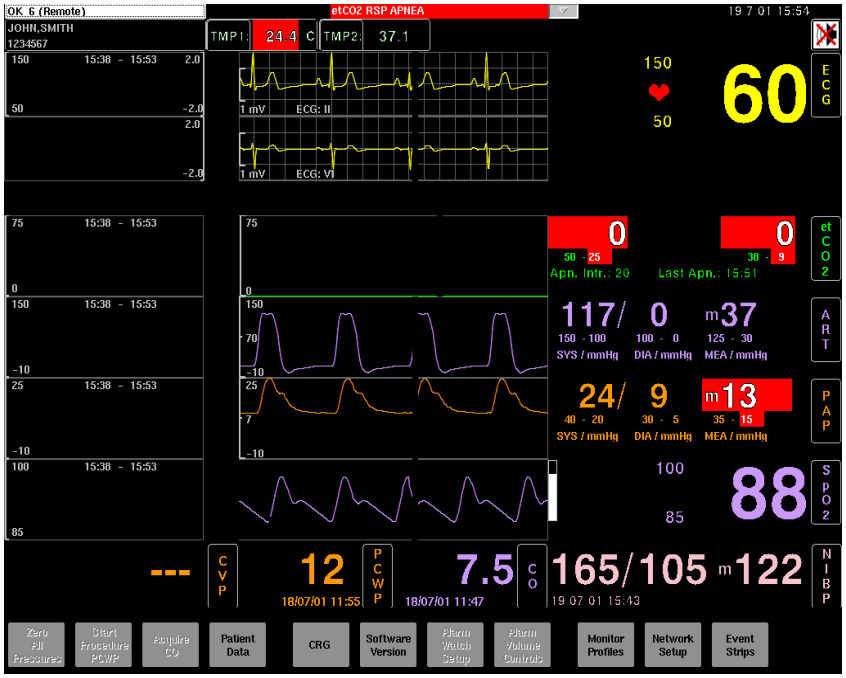


Figure 7-2: Waveforms and Trend Special Display Format

➤ ***To select a Special Display format:***

1. From the Main menu select the Setup key. The **Setup** menu is displayed.
2. From the **Setup** menu, select **Display Controls**. The **Display Controls** panel appears.
3. Under **Display Format**, select the **WaveForm + Trend** checkbox for Waveform and trend display.

   When **Waveform & Trend Format** is selected:

- Both waveforms and trended data are displayed in a “split-screen” format.
- From the **Trend Time Scale** drop-down list, select the time scale for the trended data. The available options are: **15**, **30**, **60** and **120** minutes.

4. Clear the checkbox for regular display. The screen is divided according to the number of selected parameters.
5. Press **Main Screen** to return to the main screen display.

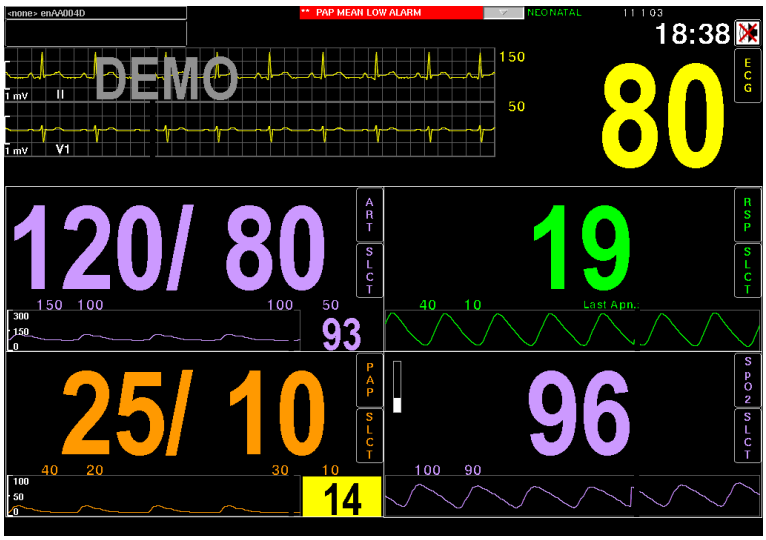
Very Big Numbers Display

Use the Very Big Numbersdisplay mode to view four of the available vital signs (SpO2, Temp, NIBP or ART pressure Systolic/Diastolic, and Respiration Rate or EtCO2/Resp Rate) with large font in four boxes and two channels of ECG waveforms with HR (Figure 7-1).

➤ ***To activate the Very Big Number display:***

1. Set the **Very Big Number** toggle in the **Setup - Display Controls** window to ON (green) (Figure 7-1).
2. Toggle **VBN Select** to ON (green) to select which of the vital signs appears in each box.

A **SLCT** (select) key is added to each of the boxes.



3. Activate the **SLCT** key.

This opens the list of Vital Signs and enables selecting the vital sign for each of the four boxes.

4. Set the VBN Select toggle to OFF to fix the vital signs in the boxes.

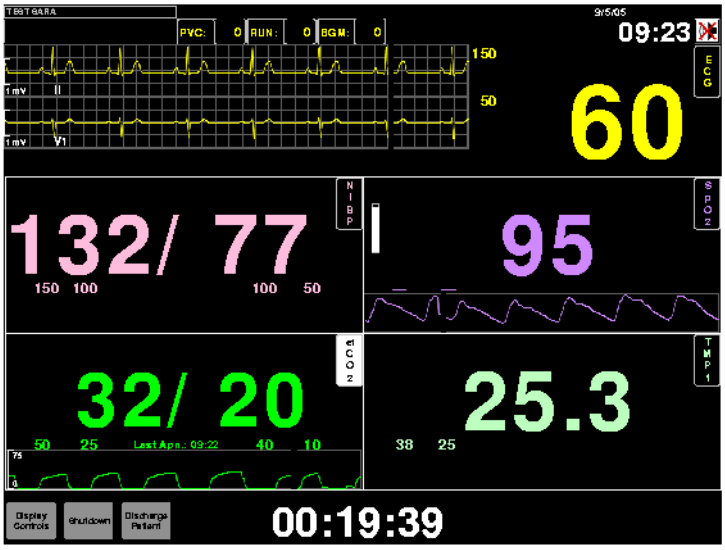


Figure 7-3: The Very Big Number Screen

Cardio Respiratory Graph (CRG)

The **C**ardio **R**espiratory **G**raph is used to display changes in vital signs within a time frame of 1.5 to 30 minutes (rather than in seconds, as is the case for waveform display). Viewing changes over this greater period is especially important in neonatal monitoring, where Respiration, Heart Rate and SpO2 tend not to be constant.

The ***Menntor X7*** supports the following time frames:

- 1.5 min
- 3 min
- 6 min (default)
- 12 min
- 30 min

Two independent CRG displays can be shown on the ***Menntor X7*** screen, as CRG-1 and CRG-2. Each CRG display can present two parameter traces, one above the other - for a total CRG mode display of up to 4 parameters. Each graphical trace is accompanied by a vertical scale.

The CRG display also supports a grid, which can be activated or hidden for all CRG parameters.

The parameters that can be selected for display in CRG mode are:

- Respiration/CO2 Waveform
- All Vital Signs

The default parameters are: Heart Rate, Respiration/CO2 Waveform and SpO2.

Note: *Only currently monitored parameters can be selected for display.*

CRG Display

The two CRG displays appear at the bottom of the screen above the Big Numbers.

Note: *If there is insufficient space to display all of the monitored vital signs waveforms, along with the CRG displays, then one or more of the vital signs will be relegated to Secondary Vital Sign status, according to the defined parameter hierarchy. Upon exiting the CRG mode, the vital signs will automatically return to their previous waveform format.*

The two CRG displays (CRG-1 and CRG-2) are displayed, one above the other and are divided into two parts. Graphical traces are given on the left; parameter values, duration selection and grid information are given on the right of the screen.

Each CRG display is further divided to show up to two parameters. The two parameter traces of the CRG display are generated within the same time frame, and can thus be overlapped to show point-to-point time correlation; their parameter values and grid information are defined as being “left” side and “right” side in the Setup panel, according to their position on the display.

Each trace is accompanied by a vertical scale (which can be displayed either on the left or right side of its graph).

In the following example, CRG-1 and CRG-2 displays are shown, with each display containing two parameters:

- Upper Display parameters shown for CRG-1 are: HRT/BPM (Left Param) and SpO2 (Right Param);
- Lower Display parameters shown for CRG-2 are: RESP/BPM (Left Param) and ARTd/mmHg (Right Param).
- Traces are shown on the far left of the screen;
- Vital Signs information is shown on the far right of the screen.
- Selected duration time and Grid Units (if configured in the parameter’s display options) are shown on the far right side (just below the vital signs information).

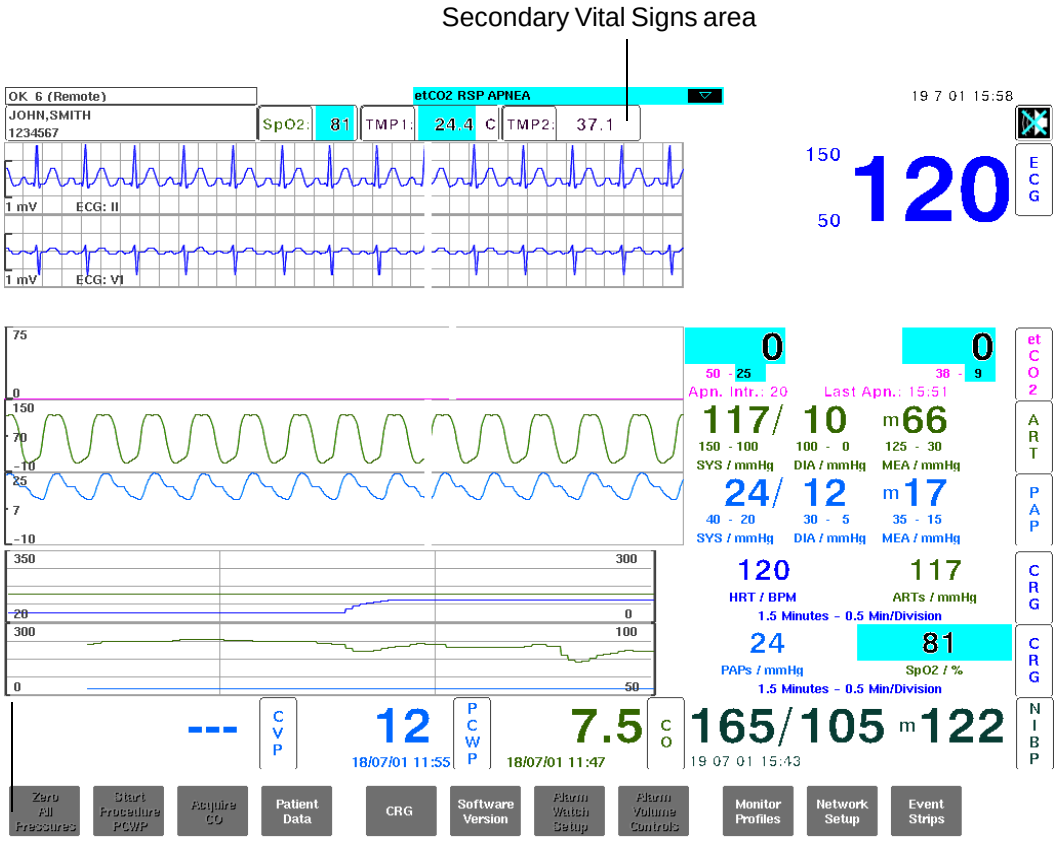


Figure 7-4: Viewing a Cardio Respiratory Graph

Note: ***Left Param*** *and* ***Right Parm*** *selection given in the* ***Vital Sign*** *box refer to the manner in which the two paramerters are displayed on the far right side of the CRG display as left and right parameters.*

The colors of CRG waveform and labels are those defined for the selected parameter.

Note: *In the* ***Menntor X7****, all displayed traces begin at the righthand side of the display and extend towards the left side, with the farthest righthand point being equal to zero or current time.*

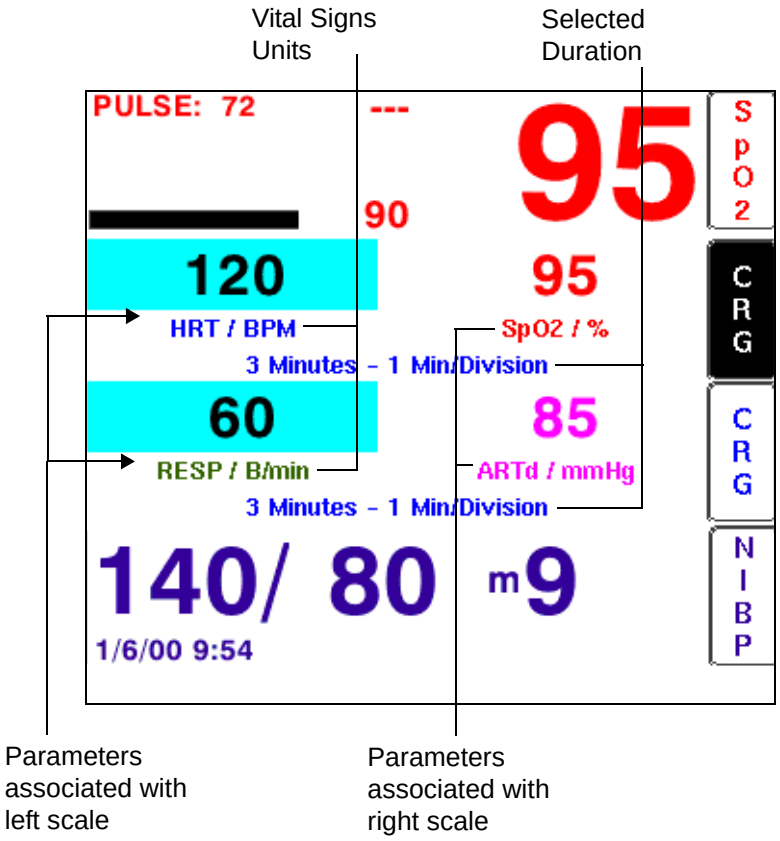


Figure 7-5: Close-up of CRG Display Area

➤ ***To activate CRG:***

1. From the Main menu select the **Setup** key, and from the **Setup** menu select **CRG**. The **CRG** panel appears.
2. Select **CRG-1**.
3. In the **Duration** box, set the duration for the selected parameter (between 1.5min to 30min).
4. Select the vital sign(s) to appear in the CRG display:
   - Under **Left Param**, in the **Vital Sign** box, select a vital sign from the list of currently active vital signs, and define the scale. The scale for this parameter will appear on the left of the graph.
   - If you want another vital sign to appear in CRG-1, under **Right Param**, in the **Vital Sign** box, select a vital sign from the list of currently active vital signs and define the scale. The scale for this parameter will appear on the right of the graph.

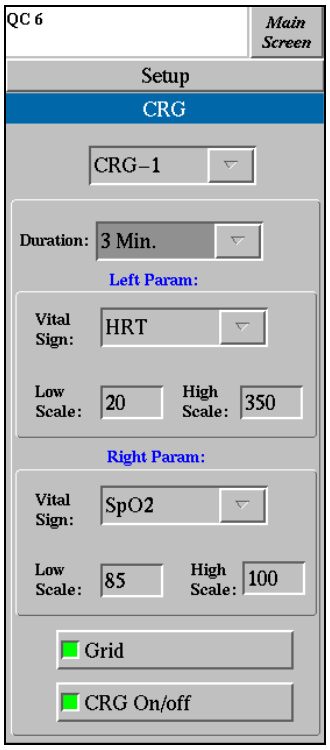


Figure 7-6: The CRG Panel

5. Select the **Grid** checkbox to display a grid.
6. Select the **CRG On/off** checkbox to activate the CRG.

   Note: *The settings for **Duration**, **Grid** and **CRG On/off** apply to both vital signs, if two were chosen.*

7. To display parameters for CRG-2, repeat steps 2 to 7.

Remote View

When monitoring a patient, you may want to view simultaneously another patient under your supervision. The Remote View feature allows you to view any other ***Menntor X7*** bedside monitor located on the same network.

When displaying a remote bed, you can view on your screen parameters of the remote bed, while continuing to monitor basic parameters of the local bed.

In remote view can only view the remote bed, and temporarily set the remote bed “all alarms” setting to off. You cannot change any other settings on the remote bed.

Note: *Bed-to-Bed Remote View is intended for temporary monitoring only while under the direct supervision of the user.*

- ***To remotely view a bed:***

1. From the Main menu select the **Setup** key. The **Setup** menu is displayed.
2. From the **Setup** menu, select **Remote View**. The **Remote View** panel opens.

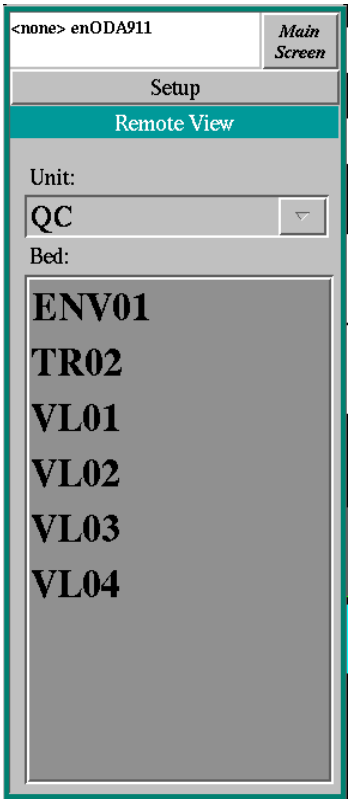


Figure 7-7: Remote View Panel

3. Select the required unit and bed.
4. Click **Accept**. The remote bed's waveforms and measured values appears on your screen.

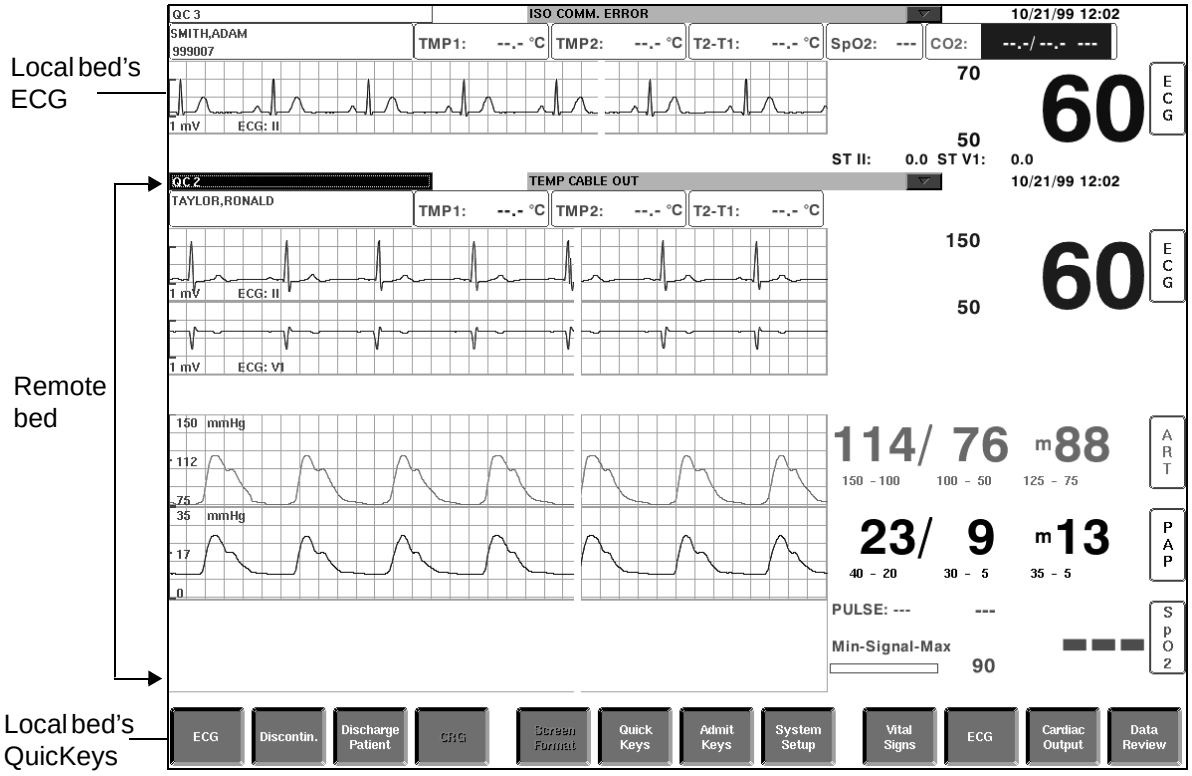


Figure 7-8: Remote View Display

The local bed's ECG and measured values are minimized, and appear at the top part of the screen. The remote bed's parameters and waveforms appear in the middle of the screen. At the bottom appear the local bed's QuicKeys™.

Remote View allows you to temporarily set "all alarms" to off at the remote bed. When exiting Remote View, the remote bed alarm setting will automatically revert to the monitor's original selection.

The local view display includes:

- **Patient global header** - contains the local bed's device name, patient name, alarm message area and date/time.
- **Waveforms and measured values** - displays the "top displayed" ECG lead and measured values.

The remote view display includes:

- **Patient global header** - contains the remote bed's device name, patient name, alarm message area and date/time.
- **Waveforms and measured values** - displays the remote bed's monitored parameters up to five waveforms, together with measured values.

Note: *While remotely viewing a patient, the **Menntor X7** QuicKnob™ is disabled.*

Setting Remote Bed Alarms to Off

Remote View allows you to temporarily silence the alarms or set all alarms to "off" at the remote bed. When exiting Remote View, the remote bed alarm settings will automatically revert to the monitor's original selection.

- To silence alarms occurring at the Remote bed press "**Silence**" on the front panel of the ***Menntor X7***. The audible execution of the alarms will be temporarily disabled for 2 minutes. The visual display of the alarms will still be present on the display.
- To set all the alarms off at the Remote bed press "**Alarms Off**" on the front panel. The audible and visual display of alarms will be disable until the user exits Remote View. When exiting Remote View the Remote bed's alarm setting will automatically revert to the monitor's original setting.

Note: *Should an audible alarm occur, it is always associated with the Local Bed. There is no transfer of audible alarm information from the remote site in remote viewing.*

Printing and Recording Data

While in remote view, you can print and record data of the remote bed only. To print or record data from the remote bed, press the **Print** or **Record** buttons Main menu **Utilities** menu..

To exit the remote view:

- On the local bed's front panel, press the **Main Screen** button. The remote bed disappears from your screen, and the local bed is redisplayed.

Returning to Local Viewing

While in Remote View, you can return immediately to Local View by pressing "**Main Screen**" button on the front panel.

Note: *Remote View has automatic timeout with return to Local View. This time-out is set by the System Administrator under the timeout panel and is the same setting as for any full panel (namely: 1, 2, 4 or 10 minutes or for no timeout).*

Note: *When Remote View is used on a display with Touch Screen, it is possible to return to the Main Screen by touching the Remote View area*

Alarm Watch

When monitoring a local patient, you may want to simultaneously view the clinical data of a remote patient under your supervision that enters alarm status.
The **Alarm Watch** feature allows you to view any other ***Menntor X7*** bedside monitor located on the same network that enters alarm status.

To view the alarms of a remote bed, you must first set the local monitor for **Alarm Watch** in the Setup menu.

Any remote bed set for Alarm watch that enters alarm status will send a message to the "watching" ***Menntor X7*** and give also an alert tone and/or provide automatic Remote view of the remote bed.

When displaying a remote bed you can view parameters of the remote bed, while continuing to monitor basic parameters of the local bed. In remote view you can only *view* the remote bed, and temporarily set to "off" the remote bed "all alarms" setting. You cannot change any other settings on the remote bed.

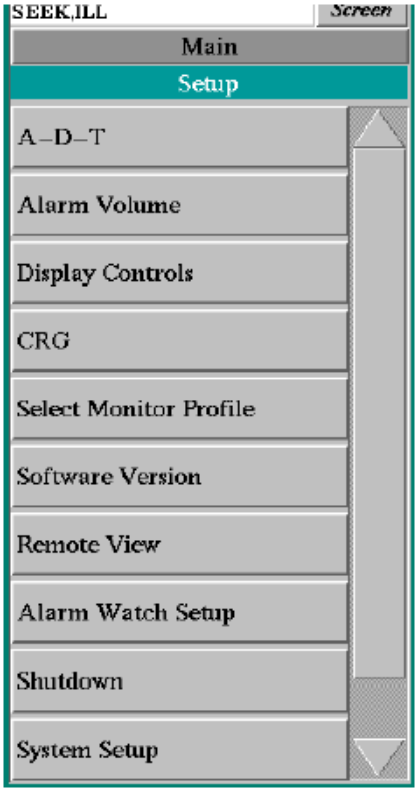


Figure 7-9: Alarm Watch Setup menu

- ***To select the beds for alarm Watch:***

1. From the Main menu select the **Setup** key. The Setup menu is displayed.
2. From the **Setup** menu, select **Alarm Watch Setup**. The **Alarm Watch Setup** panel opens.
3. Select the required **unit** and **bed**s .

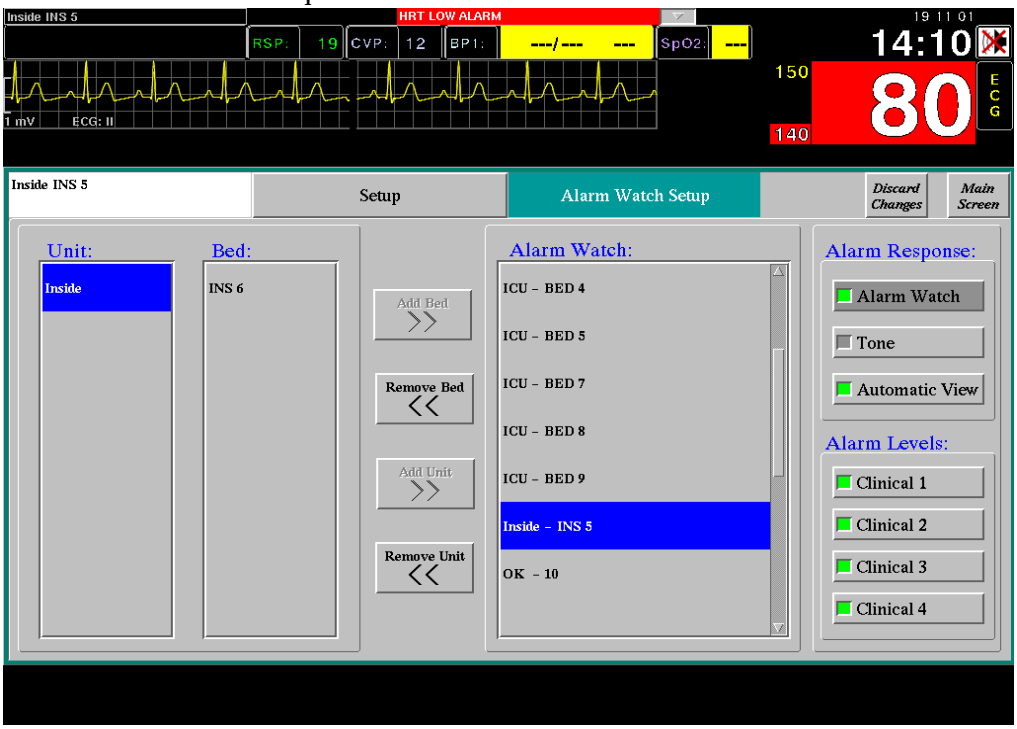


Figure 7-10: Alarm Watch Setup

4. Either "**Add Unit**" or "**Add Bed**"
5. The selected beds will appear on the Alarm Watch panel
6. To remove beds from the Alarm Watch panel use "**Remove Bed**" **and "Remove Unit**" keys.
7. Set the alarm response to "**Alarm Watch**" and than set response to "Tone" and/or "**Automatic View**" .
8. Select the alarm level at which you wish the Alarm Watch to function
9. Click "**Main Screen**" to exit the panel and accept the Alarm Watch settings
10. Click on "**Discard Changes",** to discard changes and exit to the main screen

Alarm Watch Function

If “Automatic View” was set to “on” (green), then upon alarm activation of the selected level on the remote bed, a remote view panel is superimposed on ¾ of the ***Menntor X7*** screen.

The local bed’s ECG and measured values are minimized and appear at the top part of the screen. The remote bed’s parameters and waveforms appear in the middle of the screen. The local bed’s QuicKeys™ appear at the bottom.

Remote View allows you to temporarily set “all alarms” to off at the remote bed.

When exiting Remote View, the remote bed alarm setting will automatically revert to the local monitor’s original selection. The remote view will stay on the screen for the timeout (default of 2 minutes) of Large panel, or until you press “Main Screen”. If “Automatic View” was set to off (gray), then upon alarm in one of the remote beds, a message with or without tone will appear on the top right corner of the local ***Menntor X7*** screen.

Figure 7-11: Patient data menu

➤ ***To view the beds in alarms***

1. From the "**Patient Data menu**", select "**Alarm Watch"**
2. The "**Alarm Watch"** panel will appear .

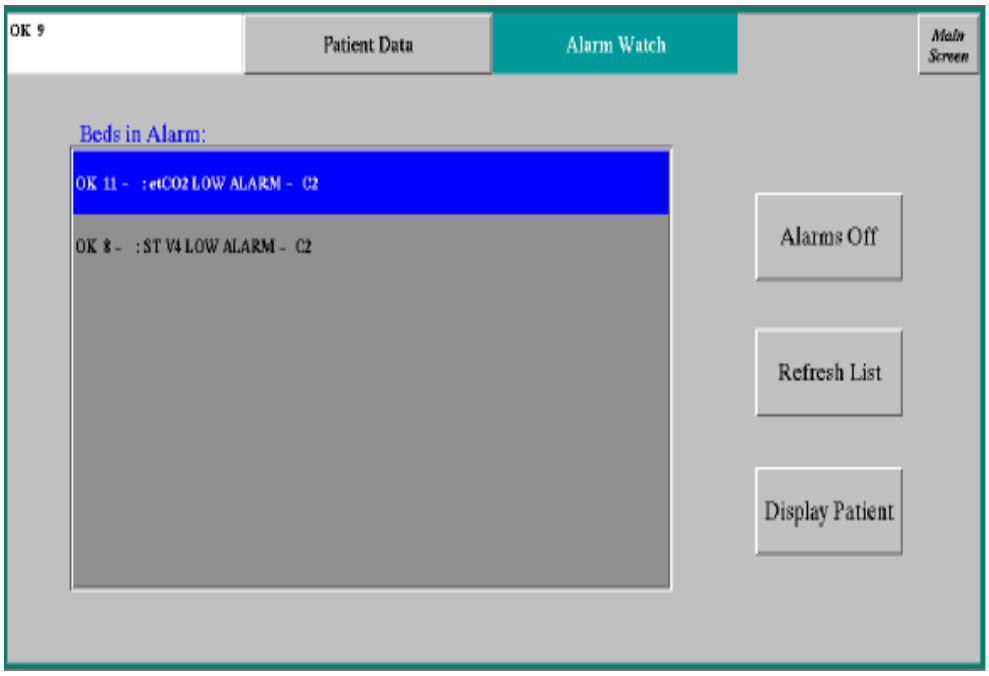


Figure 7-12: Alarm Watch

3. On the panel all the beds that are in "Alarm Watch" and are in alarm state are listed under the label "Beds in Alarm"
4. Use the QuicKnob™ to select the " Beds in Alarm" panel
5. Select a bed and either set "Alarm Off" (in this case, the alarm of the remote bed is off and will not be displayed on the local bed) or
6. Select "Display Patient" (to enable remote viewing of the selected bed)
7. Press the "Refresh list" knob to "refresh" the list – in this case, you will remove selected beds from their alarm status and add new beds with new alarms.

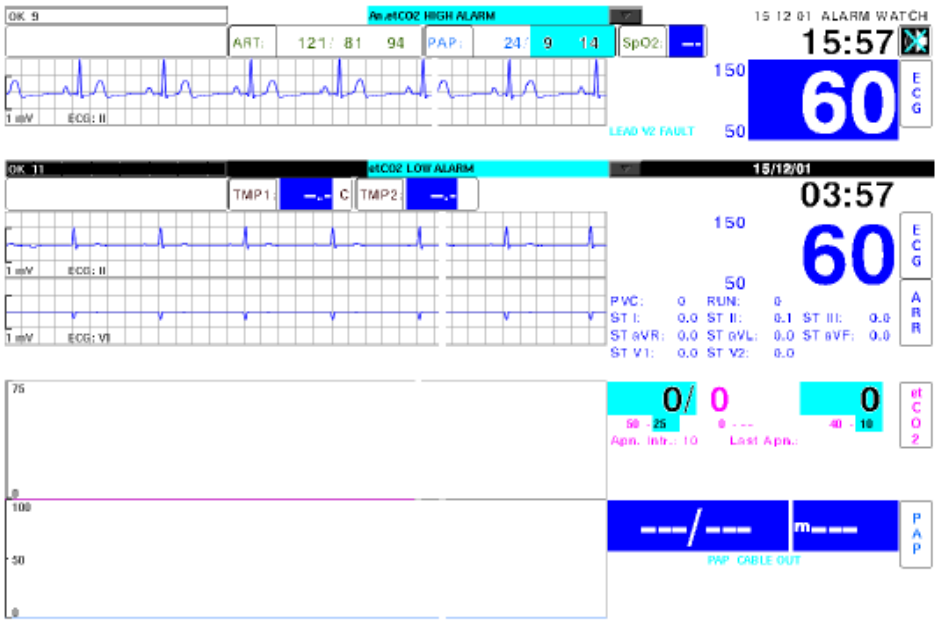


Figure 7-13: Menntor X7 with Alarm watch - Remote view

Return to Local View

While in Remote View, you can return immediately to Local View by pressing **"Main Scree**n" button on the front panel of the ***Menntor X7*** CPU.

Note: *Remote View has automatic timeout with return to Local View. This time-out is set by the System Administrator under the* ***Timeouts*** *panel and is the same setting as for any Full Panel (namely: 1, 2, 4 or 10 minutes).*

The default timeout setting of the factory is 2 minutes. It is possible to manually select continuous display of the remote bed (no timeout). To do so, go to **System Setup**, **General Settings, Timeouts**, and select "none". To remove the continuous remote display, press the Main Screen button on the front panel.

CHAPTER 8: ALARMS

General Features

Alarms are detected by each ***Menntor X7*** input according to pre-configured alarm settings. The information is sent to the main processing unit for verification to avoid false alarms. When an alarm is triggered, the following occurs:

- An audio signal and a visual display on the main screen are generated.
- An alarm event entry is automatically stored in the charts.
- Peripheral devices such as recording an event are activated.

When the condition which triggered the alarm has passed, the monitor immediately sends a stop alarm message to the main processing unit. The monitor then removes alarm notification (depending on the latched status of the particular alarm. See “Latched Alarms” on page 8-7).

Alarms can also be documented and stored in the monitor for future reference and/ or printed out.

WARNING!!! *Patient monitor alarms do not treat the patient's condition! It is the responsibility of the medical team to always be at a location where the alarm can be detected, either around the bedside or at the Central Nurse Station*

WARNING!!! *The alarm limits for each vital sign should be set to the limits of the normal range of each parameter. Alarm efficiency will be lost if the limits are set to a wide range that is not clinically logical.*

CAUTION! *User (nurse or physician) should set the alarm limits of each parameter according to the patient's clinical state and confirm that out-of-limit values produce alarms.*

Alarm Distribution

Monitors connected to the LAN network send the alarm status repeatedly along the network every 10 seconds . The alarm appears on the Ensemble Central station, the

Enguard remote monitor, and any monitor on the network that has activated the Alarm Watch (“Alarm Watch” on page 7-13).

Alarm Delay

Clinical Alarms are delayed after a change of the vital sign due to two factors:

- The monitoring delay due to signal averaging
- The preset alarm delay

The **monitoring delay** is the delay between the time the vital sign has changed to the moment the new value is displayed on the monitor screen. This delay is a result of the averaging character of each of the vital signs. This delay is between 4 to 8 seconds.

For example change of HR from 80 to 120 BPS will reach 106 (37% of the change) within 3 seconds, and 117 (63% of the change) within 6 seconds.

A change of HR from 80 to 40 BPS will reach 57 (63% of the change) within 2 seconds.

The **preset delay** is set in the System Setup (Password protected) between 3, 5 between 3, 5, 10, 15, and 20 seconds. This delay is set by the system manager for each of the vital signs separately.

Default is 5 second for all vital signs and 0 seconds for arrhythmias.

The addition of preset delay is provided to reduce the fault alarms due to short term changes in vital signs.

The **total delay** is the sum of the above delays and is between 8 and 14 seconds.

Alarm Notification

When an alarm condition is detected, the ***Menntor X7*** informs you by providing both visual and audible messages.

The alarm appears on the Ensemble central nurse station and on the Enguard remote monitor with a delay of up to 1 second.

Alarm Lights

Red and yellow lights on top of the monitor will signify the priority of the alarm.

High priority alarms (C1) are identified by a **blinking red** light

Medium priority (C2) are identified by a **blinking yellow** light

All other alarms are identified by a **continuous yellow** light.

Visual Response

Identifying the source of an alarm is made easier by the display of alarm messages and a change in the color of the vital sign which has generated the alarm. Clinical level alarm messages are displayed in the alarm message area and are arranged in order of priority (see "Alarm Priority" on page 8-4). Alarms of a technical nature are displayed in the primary vital sign area.

Alarm messages displayed in the alarm message area appear as white text on a red background. If more than one alarm is generated at the same time, the highest priority alarm appears on screen.

The Alarm priority will be marked on each of the alarm messages by :

******* : for **High** priority (C1)

****:** for **Medium** priority (C2)

*** :** for **lower** priority

You can scroll through a list of alarms by using the pull-down list. If more that one alarm having the same priority level is generated at the same time, they are sorted in chronological order (first generated, first displayed).

Audio Response

Five alarm levels are available in the ***Menntor X7***.

The High (C1), Medium (C2) and Low (C3) priority audible alarm sounds, are according to the requirements of the ISO 60601-1-8.

Audio response to alarms can be disabled in the Alarm Response dialog panel of each monitored vital sign.

Each alarm priority level is represented by a different alarm tone. Each tone can be adjusted to suit you working environment or personal needs. A set of tones is supplied with the system.

For SpO2, Low HR and High HR alarms can have either a standard clinical alarm (C1, C2, C3) or a unique tone. This tone can be modified in system configuration, but it remains unique in comparison to other alarm tones. Any other alarm with the same priority overrides an SpO2 alarm; therefore, the unique tone is heard only when an SpO2 alarm exists at a priority level of C-1 or C-2 and no other alarms are active.

Note: *Additional *.wav user defined files are avialable. These do not have the characteristics required by the standard.*

Note: *Specific parameter sounds, such as High HR, Low HR, and SpO2 Unique do not have the characteristics required by the standard, since they do not represent Alarm Priority.*

Note: *The following alarm sound levels were measured in a room with a surface according to ISO 3744, using a test pulse of continuous duration A-weighted background noise of 45 dB:*
C1 level is 83 dB, C2 is 83 dB and C3 is 82 dB.

Storage

Any clinical level alarm is automatically entered in the vital signs and ST charts. The entry includes the cause of the alarm (listed in the chart's status field) and the vital sign which triggered the alarm.

Recording

If the Menntor X7 is connected to an inbuilt recorder (optional) or to the Enscribe, network recorder and network printer, , an alarm event can be recorded to document the transition from a normal state into the alarm condition. A recording shows several seconds of information prior to the transition and an equal amount of time after that transition taking into account the delay factor used in the parameter. This delay factor means that transition actually occurred before the input notified the main processing unit.

Recording duration is set in System Configuration by the hospital System Administrator or Biomedical Engineer.

Alarm Recording Waveform Selection

An alarm recording usually contains two traces, the primary ECG and the other parameter in alarm (if not ECG). When the alarm is triggered by an event whose source is the primary ECG, only that trace appears on the recording.The following table gives some examples of traces recorded due to an alarm event:

Table 8-1: Alarm Recording Waveforms

Alarm Event	*Upper Trace*	*Lower Trace*
HRT (3 cable lead)	Primary ECG (single channel recording format)	N/A
Arrhythmia Alarms	Primary ECG	Secondary ECG
ART	ART waveform	Primary ECG
Apnea Alarm	Resp waveform	Primary ECG

Alarm Priority

Bedside alarms have different priority levels which affect the order of audible and visual alarm notification.

The following list is presented in order of descending importance:

- **Clinical Level 1 (C-1)** - Emergency. A life-threatening situation requiring immediate response.
- **Clinical Level 2 (C-2)** - Abnormal. A situation requiring a prompt response.
- **Clinical Level 3 (C-3)** - Notification to make staff aware of the condition.
- **Clinical Level 4 (C-4)** - Notification to make staff aware of the condition.
- **Technical Level 1 (T-1)** - Notification that monitoring has stopped due to equipment trouble.
- **Technical Level 2 (T-2)** - Notification of an equipment-related problem.

Except for the priority level of life-threatening alarms, the priority level for all parameter alarms can be defined. Life-threatening alarms are fixed at the highest priority. Alarm priority is defined in the Alarm Response panel of each monitored vital sign.

Alarm Response Priority Level

The following table describes the default audible and visual indication associated with each alarm priority:

Table 8-2: Alarm Response

Priority	***Audible response***	***Visual Response***
Clinical Level 1 (C-1)	**bbb-bb --- bbb-bb** repeat every 2.5 Sec	Blinking Red
Clinical Level 2 (C-2)	**bbb-bb** repeat every 5 seconds	Blinking Red
Clinical Level 3 (C-3)	**ec** - repeat every 15 seconds	Blinking Yellow
Clinical Level 4 (C-4)	**ec**- - repeat every 20 seconds	Continuous Yellow
Technical level 1(T-1)	**Aaa-Aa --- Aaa-Aa** repeat every10 sec	Continuous Cyan
Technical level 2(T-2)	**Eee** repeat every 20 sec	Continuous Cyan
SpO2 unique alarm	**Hi-Lo-Hi pause Hi-Lo-Hi** every 5 sec	Blinking Yellow

Note: *When an alarm color is the same as the normal display color of the vital sign, alarm background and foreground colors are reversed.*

Upgrading of Alarm Priorities

In the ***Menntor X7***, when alarms are triggered simultaneously, the system responds by upgrading the alarm response to a higher priority level than that of each individual alarm. For example, if two priority level C-2 alarms are triggered simultaneously, the monitor upgrades the response to priority level C-1.

Table-8-3 summarizes the alarm response priority for multiple alarms.

Table 8-3: Alarm Priorities Upgrade Scheme

Alarm A	*Alarm B*	*Response Level*
C-2	C-2	C-1
C-3	C-3	C-2
C-3	C-2	C-2
C-4	C-4	C-3

Normal priority response is restored when the system returns to a single alarm condition.

Setting Up Alarms

Setting up alarms for each monitored vital sign is divided into two functions: alarm limits and alarm response. The high and low limits that can trigger an alarm are set in the **Alarm Limits** panel. The way the alarm is visually and audibly manifested on the system is set in the **Alarm Response** panel. A dialog panel for each of these functions exists in the menu for the appropriate parameter. For a description of alarm setup procedures, refer to the section for each vital sign.

Alarm Controls

Alarm Silence

The **Silence** button (fixed key) on the front panel of the CPU is a toggle button - pressing it stops all audible alarms, and pressing it again enables all audible alarms. The silence time can be defined in **System Setup/Alarm Volume & Control**, from between 30-300 seconds.

The **System Setup** enables you to set when to terminate the silence period occurs:

- When time-out expires
- When a new alarm occurs

Note: *Pressing the silence button affects only the local **Menntor X7** bedside monitor. The Enguard or Ensemble Nurse Stations do not silence a remotely viewed **Menntor X7**.*

Parameters which are measured periodically (such as NIBP) are handled differently. In this situation, the alarm is not reinstated after the 60 second silence period. Only a new alarm triggers a new audible response. This prevents a situation in which the vital sign is no longer being measured but the alarm is still active.

Silence applies to both clinical and technical level alarms.

CAUTION! *In monitoring systems with Enguard and Ensemble central nurse station it is not possible to silence the alarm remotely.*

Alarms Off

When pressed, the “Alarms Off” key disables all detection of clinical alarms for a pre-defined period of 60 seconds. Technical alarms are still detected and visually displayed in the appropriate area on the main screen.

CAUTION! *In monitoring systems with Enguard and Ensemble central nurse station it is possible to set alarm to off remotely. The alarm will return when the Time out expires.*

Latched Alarms

Sometimes a vital sign parameter goes into alarm and then returns to normal range on its own. The alarm is removed from the screen before it is noticed by the staff. The ***Menntor X7*** uses the latched alarm feature to inform you of the alarm event. When alarm latching is activated, the alarm message remains in the message area even after the condition which triggered the alarm has corrected itself. When alarm latching is deactivated, the alarm message is removed from the message area once the condition which triggered the alarm no longer exists.

A latched alarm can be unlatched by pressing either the **Silence** or **Alarms Off** key on the front panel.

Alarm latching is set in System Configuration. Default configuration specifies that alarm latching is deactivated. Consult your hospital biomedical engineer to see if any alarms are latched on your system.

Note: *Only clinical alarms can be latched.*

Alarm Volume Control

The master volume for all alarms can be set in the **Alarm Master Volume** panel which can be accessed from the **Setup** menu.

Note: *The sound pressure level of the high priority (C1) and Medium Priority (C2) is 83dB*

CAUTION! *Set the alarm volume to a level that overcomes the background noise. Alarm volumes that are less than ambient levels, can impede operator recognition of alarm conditions.*

➤ ***To set alarm master volume:***

1. From the main menu select **Setup**. The Setup menu is displayed.
2. From the **Setup** menu, select **Alarm Master Control**.
3. Select 1-10 to set alarm volume to the required level.
4. Select **Off** to disable audible alarm.
5. Press **Main** to return to the **Main** menu.
6. Press **Main Screen** to return to the main screen display.

Alarm Limits

Alarm limits for each vital sign being monitored are defined in the relevant vital sign panel. The following parameters can be set:

- High and Low Limit Detection - Enable/Disable
- High and Low Limit Value

Values are entered by setting the limits on a scale with a slider. While setting alarm limits, the current value is displayed.

Auto Setting Alarm Limits

When activated, in System Setup/Default Alarm Limits, the Auto-Set (Dynamic Alarm) option automatically calculates alarm limits based on the current vital sign value. On the alarm limit panel use **Auto Set to Defaults**, to automatically set alarm limits around the patient's vital signs value.

Note: *To activate this option the system manager has to set the alarm limits in the System Setup (Appendix D“Setting Up the System ” “Default Alarm Limits” on page D-18), to Dynamic mode*

See Appendix C for the formula of the Auto-Set - Dynamic Alarm limits.

Alarm Limits Off

You can deactivate alarm processing and detection for any individual vital sign in the relevant vital sign panel. All clinical alarm detection stops for the vital sign and any related sub-parameters. Technical alarms are still detected.

Setting of any parameter limits to **off** adds an icon to the vital sign label:

For example:

Alarm Status

The **Alarm Status** dialog panel lets you review all of the alarm limits set for a patient. The alarm limits for each monitored vital sign are displayed on the panel. You can deactivate individual alarms and adjust alarm limits for all monitored vital signs without having to access each vital signs separately.

Accessing the Alarm Status Dialog Panel

The **Alarm Status** panel can be accessed from the **Vital Signs** menu.

➤ ***To access the Alarm Status panel:***

1. On the Main menu select the Vital Signs menu. The Vital Signs menu is displayed.
2. From the **Vital Signs** menu, select **Alarm Status**. The **Alarm Status** dialog panel is displayed.

Note: *The Alarm Status panel displays alarm status for all active parameters. Non-active parameters are not displayed.*

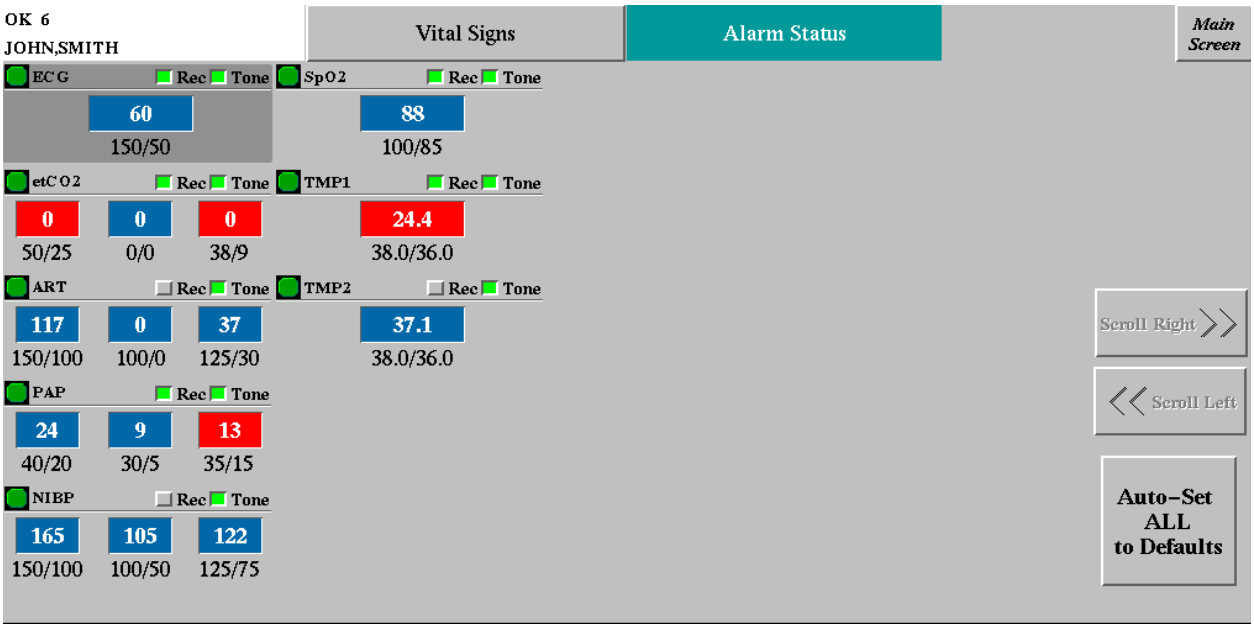


Figure 8-1: The Alarm Status Dialog Panel

➤ ***To set alarm limits from the Alarm Status dialog panel:***

1. Turn the QuicKnob™ until the vital sign for which you want to adjust alarm limits is highlighted. Press the knob. The same functions that are available on the Alarm Limits panel for that vital sign are displayed on the Alarm Status panel.
2. Select the **All HRT Alarms** checkbox to activate or deactivate both high and low limit alarms
   –or–
   select the **Enable Alarm** checkbox located below the low and high alarm scales to activate or deactivate either the low or high alarm limit. By default, both alarms are activated.
3. Set the low and high limit values by turning the QuicKnob™ until the required scale is highlighted. Press the QuicKnob™ and turn until the correct limit is set. Turn the QuicKnob™ while pressing to set limits in smaller increments. The limits you have set appear in the Low and High Limit values areas on the panel.
   –or–
   Press **Auto-Set to Defaults** to set alarm limits to default values.
4. Press **Vital Signs** to return to the **Vital Signs** menu
   –or–
   Press **Main Screen** to return to the main screen display.

What To Do When an Alarm Occurs

When an alarm is generated, an alarm message appears in the Global Message area on the main screen display and/or an audible alarm can be heard.

Note: *When an alarm occurs, you should always first check the condition of the patient.*

Alarm Checklist

Identify the alarm and act appropriately, according to the cause of the alarm .

- ☐ Identify the monitor in alarm.
- ☐ Check the condition of the patient.
- ☐ Identify the cause of the alarm.
- ☐ Silence alarm, if necessary.
- ☐ When the cause of the alarm has resolved itself, make sure that all settings are correct for further alarm detection.

See “Alarm Messages” on page 8-12 for a list of all alarm messages.

Sound Events

The Monitor provides several Sound Events that should not be confused with alarms.

In System Setup (Appendix D “Sound Event” on page D-17) there is a description of the available sound events and the sound and amplitude can be monitored prior to activation.

Alarm Messages

The following table lists all ***Menntor X7*** alarm messages:

Table 8-4: Alarm Messages

Vital Sign	*Alarm*	*Alarm Message*
All Vital Signs		(name of parameter) ”High Alarm”
		(name of parameter) “Low Alarm”
		(name of parameter) “Fault”
		(name of parameter) “Artifact”
		(name of parameter) “Cable Out”
ECG	RL or more than one lead fault	“RL Fault”
	V1 lead fault	• “Lead V Fault” when only 1 lead is used • “Lead Va Fault” when 2 leads are used • “Lead V1 Fault” when more than two V leads are used
	V2 Lead Fault	• “Lead Vb Fault” when only two V leads are used • “Lead V2 Fault” when more than two V-leads are used
		“Lead V3 Fault”
		“Lead V4 Fault”
		“Lead V5 Fault”
		“Lead V6 Fault”
		“Lead RA Fault”
		“Lead LA Fault”
		“Lead LL Fault”
		“All Leads Fault”
		“PVC”
		“Bigeminy”
		“Trigeminy”
		“Couplet”
		“Triplet”
		“Interpolated PVCs”
		“Multifocal PVCs”
		“R on T”
		“Idioventricular rhythm”
		“Pause”

Table 8-4: Alarm Messages (Continued)

Vital Sign	*Alarm*	*Alarm Message*
		“Supraventricular rhythm”
		“PAC”
		“Extreme Tachycardia”
		“Extreme Bradycardia”
		“Asystole”
	V Tachycardia	“V-Tach”
	V Fibrillation	“V-Fib”
		“Run”
		“Irregular Rhythm”
		“Pacer not sensed”
		“Pacer non function”
		“Pacer non capture”
BP		“High Systolic Alarm”
		“High Diastolic Alarm”
		“High Mean Alarm”
		“Low Systolic Alarm”
		“Low Diastolic Alarm”
		“Low Mean Alarm”
		“Not Zeroed”
		“Zero in progress”
		“Zero Failure”
	Unstable transducer/ Transducer failure	“Transducer Fault”
NIBP		“High Systolic Alarm”
		“High Diastolic Alarm”
		“High Mean Alarm”
		“Low Systolic Alarm”
		“Low Diastolic Alarm”
		“Low Mean Alarm”
		“NIBP No Systolic”
		“NIBP Air Leak”
		“NIBP Over Pressure”

Table 8-4: Alarm Messages (Continued)

Vital Sign	*Alarm*	*Alarm Message*
NIBP cont.		“NIBP Communication Error”
		“NIBP Device Error”
		“NIBP Unit Error”
	Inflate time exceeds 3 minutes	“Inflation Time Out”
	Difficulty in making measurements due to weak pulse, tremors, movement, etc.	“Measurement Fault”
RESP		“Apnea Alarm”
		“Hi Apnea Alarm”
		“Low Apnea Alarm”
		“Apnea Alarm Off”
		“RSP/ECG Coincidence”
SpO2		“Low O2 Sat:
		“Hi Pulse Rate”
		“Low Pulse Rate”
		“SpO2 Relocate Probe”
		“SpO2 Wrong Probe”
		“SpO2 Check Probe Site”
		“SpO2 Probe Disconnected”
		“SpO2 Replace Probe”
		“SpO2 Low Signal”
		“SpO2 Low Light”
		“SpO2 C-Lock mode”
EtCO2		“Device Error”
		“Apnea”
	Very low signal	“Check Adaptor”
	Watertrap not found	“No Watertrap” (only for Sidestream monitoring)
	Watertrap occluded	“Replace Watertrap” (only for Sidestream monitoring)
	Exhaust occluded	“Check Exhaust Line” (only for Sidestream monitoring)
		“Noisy signal”
	Signal saturation	“Check Adaptor” (for Mainstream monitoring) or “Device Error” (for Sidestream monitoring)
	Upstream pneumatic leak	“Device Error” (only for Sidestream monitoring)

CHAPTER 9:
CONNECTING A PATIENT TO MENNTOR X7

Patient Preparation

Procedures for preparing the patient for monitoring of vital signs can be found in the section for each relevant vital sign.

Admission, Discharge and Transfer Procedures

The **ADT** menu provides access to panels that deal with administrative procedures. These panels include:

- **Patient Identification**
- **Discontinue Monitoring**
- **Save and Discharge**
- **Discharge Patient**

Admitting a Patient

The admission process is divided into two stages:

- Physically connecting the patient to the monitor and initiating monitoring of physiological parameters.
- Filling in an admission form (the Patient Identification panel) with the relevant demographic data.

Note: *If the monitoring system is equipped with a Mennen Medical Server that connects between the Mennen-Net LAN and the hospital LAN Hospital Information System (HIS) you can use the HIS information to get the patient demographics from the HIS to the monitor (see "Admit via HIS" on page 9-4).*

These two stages can be performed independent of each other. Generally, patient information is entered into the Patient Identification Panel after the patient has been physically connected to the monitor. In cases where a patient is expected, the

information can be entered before the patient arrives. This procedure is known as *pre-admission*.

When you first turn on the ***Menntor X7***, a series of defined Monitoring Profile keys appears on the screen. By selecting a Monitoring Profile, you start monitoring the patient according to default monitoring parameters. After you have monitored a patient, the parameters set for the patient are saved and can be used to monitor other patients. The **Admit as Previous** key allows you to use the monitoring setting of the patient monitored previously by the unit.

The ***Menntor X7*** makes it possible to save different monitoring parameters under different names, thereby creating user-defined admit Monitoring Profiles. You can create up to 12 user-defined Monitoring Profiles which include all definitions necessary for admitting various types of patients, such as adult, pediatric, geriatric, etc. For more about creating Monitoring Profiles, see “Setting up Monitoring Profiles” on page 9-17.

➤ ***To connect a patient and initiate monitoring:***

1. Prepare the patient.
2. Attach the electrodes, probes, transducers and insert pressure catheters as required for monitoring the patient.
3. On the ***Menntor X7*** main screen, click the Monitoring Profile that most closely matches the monitoring needs of the patient
   – or–
   click the **Admit as Previous** key to admit the new patient according to the settings used for the previous patient monitored.
4. Monitoring begins and the main screen display appears.
5. If you wish to change settings for vital sign monitoring or to the screen display, see the relevant chapter in this manual.

Note: *Default configuration may have been reconfigured by your hospital biomedical engineering department or System Administrator to suit the particular needs of your hospital or department. If the default configurations described in this manual differ from what you see on the screen, consult the relevant department in your hospital.*

➤ ***To access the Patient Identification Panel:***

- Select the Patient Demographic area on the main screen display
  –or–
  From the Main menu select the Setup key to display the **Setup** menu. Select **ADT** and then select **Patient Identification**. The **Patient Identification** panel appears.

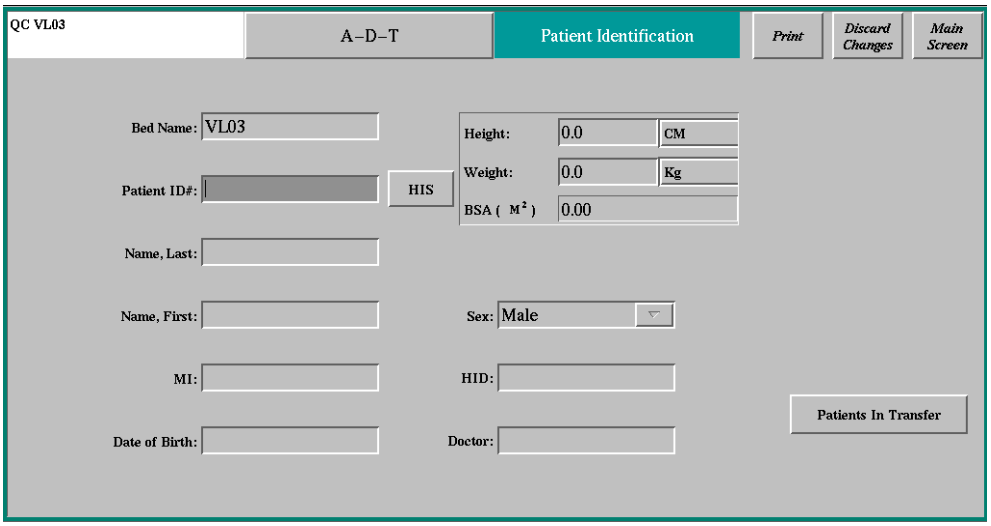


Figure 9-1: The Patient Identification Panel

Note: *The HIS key appears only if the Mennen-Net is linked to the HIS.*

The demographic data in the **Patient Identification** panel includes:

- Room number
- Patient ID #
- Patient name (last, first, middle initial)

Note: *Patient first name and surname are limited to 15 characters each, in all monitors using Latin alphabet and to 7 characters each, in Monitor with Hebrew name fonts.*

- Date of Birth
- Height
- Weight
- Body Surface Area (BSA) - calculated automatically in the monitor whenever patient height and/or weight are changed.
- Sex
- Hospital ID number
- Doctor’s name

When alphanumeric data is required, the keyboard panel opens enabling you to enter the required information.

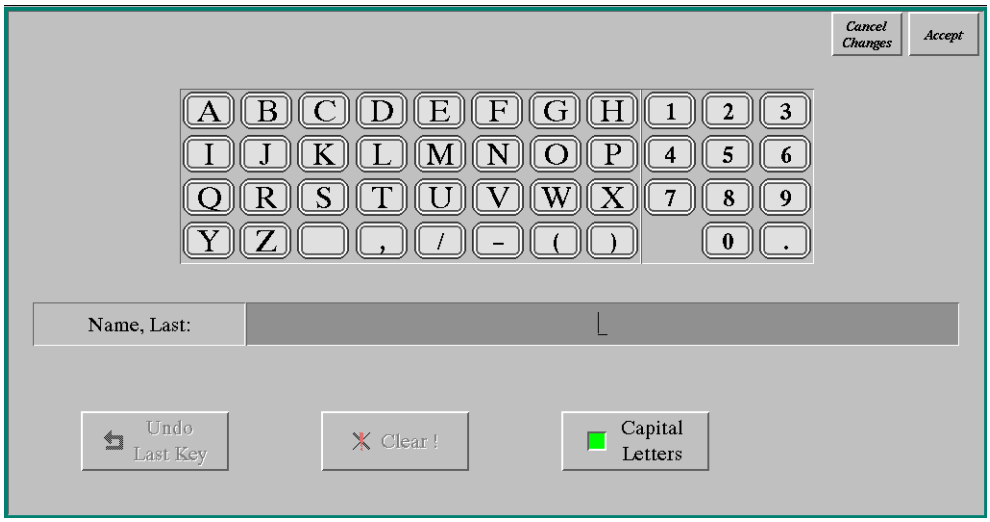


Figure 9-2: Virtual keyboard on monitor screen

➤ ***To fill out the Patient Identification Panel:***

1. Turn the QuicKnob™ clockwise or counterclockwise until you reach the required parameter. The area is now highlighted. Press in the QuicKnob™ to select the area.

   To enter the patient's height and weight, select the area and turn the QuicKnob™ to set the required value.

   To enter the patient's sex, select the **Sex** field. A list appears. Select either **Male** or **Female**.

2. Press **Discard Changes** to close the panel and return to the main screen display without implementing any changes.

3. Press **Main Screen** to close the panel, implement changes and return to the main screen display.

Admit via HIS

In monitoring system equipped with a Mennen Medical Server that connects between the Mennen-Net LAN and the hospital LAN Hospital Information System (HIS) the Server keeps a list of all patients admitted via the HIS and their monitors. This list can be used to transfer information from the HIS or Laboratory Information System (LIS) to the relevant monitor.

You can either insert the patient ID manually or using the SYMBOL LS 2208 barcode reader initialized by Mennen Medical.

➤ ***To admit via HIS:***

1. Open the **Patient Identification** panel.
2. Insert the patient ID into the **ID** box
3. Click on **HIS** button to the write of the ID box.

Note: *The HIS key appears only if the Mennen-Net is linked to the HIS.*

The patient demographic information is sent from the HIS to the **Patient Identification** panel on the monitor.

4. Press **Main Screen** to continue.

➤ ***To admit via HIS using barcode reader***

1. Place the barcode reader in front of the barcode on the patient card, and
2. Press the barcode reader switch.

This will open the Patient Identification panel, and insert the patient ID into the

"Patient ID #" box.

The patient ID will be sent to the HIS and as a result the patient demographics will be returned from the HIS to the monitor's Patient Identification panel.

During the transfer of demographic data from the HIS to the monitor a progress bar appears on top of the panel.

The patient information box (top, left) receives a green background if demographic data was received from the HIS.

3. Press **Main Screen** to continue.

Note: *During the transfer of demographic data from the HIS to the monitor a progress bar appears at the top of the panel.*
The patient information box (top, left) has a green background if the demographic data was received from the HIS.

Note: *The patient's first name and surname are limited to 15 characters each in all monitors using Latin alphabet, and to 7 characters each, in monitors with Hebrew name fonts.*

Change Patients

CAUTION! *Always discharge before admitting/monitoring a new patient.*

Starting to monitor a new patient without discharging can cause various problems:

- If a patient is not discharged from the monitor before admitting a new patient all future patient data will be stored under the name of the FIRST admitted patient.
- If then a patient will be called by TRANSFER from the list of saved patients without discharging the previous patient, the data of from the first patient will be stored under the name of the transferred patient
- If patients are monitored without inserting a name and without discharging between patients. The first patient with a name will have all the history under his/her name.
- An unknown patient starts monitoring. He/she will get a name further in time. This may require additional information stored in Save & Discharge.

Note: *If you attempt to change patient name or ID without discharging the patient, a warning message "* ***Discharge before admitting new Patient****" will appear (see Figure 9-5) .*

Discontinue Monitoring

Use the **Discontinue Monitoring** option to temporarily stop monitoring a patient. When you discontinue monitoring, the following occur:

- All monitoring functions stop
- Demographic information and all stored data is saved

➤ ***To temporarily discontinue patient monitoring:***

1. From the Main menu select the Setup key to display the **Setup** menu. Select **ADT** and then select **Discontinue Monitoring.** Patient monitoring stops, and on the screen appears the **Resume** button and the patient's name and ID.
2. To resume monitoring, press **Resume**.

Note: *BP transducers must be zeroed after resuming monitoring.*

Save & Discharge

The *Menntor X7* allows you to save patient clinical data upon discharge for future use in Patient Transfer. The saved data includes:

- Patient demographic information
- Numerical Charts
- Graphic Trends
- Event Strips (ECG and Vital signs waveform information)

➤ ***To save patient data for transfer purposes:***

1. When you discharge a patient from a monitored bed, enter the ADT menu

2. Select **"Save & Discharge"** - this will store the patient information under a "ready for transfer" file - See Figure 9-4.

If you select the **"Discharge"** panel you have the option of either discharge without any storage or **"Save & Discharge"** as above.

Note: *the Full Disclosure data is deleted and only Charts, Trends and Event strips are stored for transfer.*

Note: *to save Patient Data, the ADT panel must include at least a Patient ID or a Patient Name.*

The data of up to 3 (10 with extended memory option) patients can be saved on each individual monitor.

If you save data for more than 3 (10 with extended memory) patients, the saved data will be replaced on the basis of "First in First out" (FIFO).

➤ ***To remove saved patient data:***

1. Enter **System Setup** on the monitor in which the data was saved

2. Select **"Remove Saved Patient"** - a list of the saved patients is displayed

3. Select the patient and delete

Discharging a Patient

Use the **Discharge Patient** panel to discharge a patient. When you discharge a patient, the following actions occur:

- All monitoring functions stop
- All data stored in the monitor is erased
- The main screen display is cleared and Monitoring Profiles are displayed in preparation for admitting a new patient.

➤ ***To discharge a patient:***

1. From the Main menu select the Setup key to display the **Setup** menu. Select **ADT** and then select **Discharge Patient**. The **Discharge Patient** panel appears.

2. Press **Discharge** to stop patient monitoring and erase patient data. The ***Menntor X7*** is now ready to admit a new patient
   –or–
   Press **Cancel** to cancel the discharge. The **Discharge Patient** panel closes and you return to the main screen display.
3. Press **Main Screen** to close the **Discharge Patient** panel and return to the main screen display.

Figure 9-3: The Discharge Patient Panel

Figure 9-4: The Save and Discharge Panel

To prevent merging data from different patients, you must discharge the previous patient before admitting a new patient.
A warning message is presented if you try to change patient ID of patient name

when trying to admit a new patient before the previous was discharged, in order to protect from merging data of different patients.

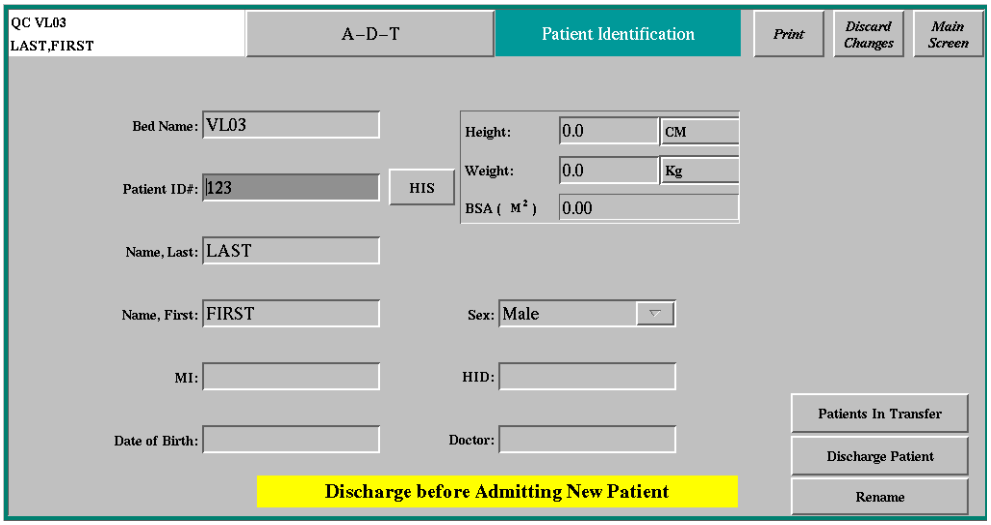


Figure 9-5: " Discharge before admitting new Patient" warning message

Note: *You can either **Discharge** the previous patient, or to **Rename**, if patient ID or name were entered with a mistake*

Patient Transfer

The Ensemble network system provides the option for the transfer of patient data across the network when the patient is transferred from one monitored bed to another. Transfer can be done from and to, an Envoy™, Vitalogik monitor or another ***Menntor X7***.

The transferred data includes:

Patient demographic information

Numerical Charts

Graphic Trends

Event Strips (ECG and Vital signs waveform information)

➤ ***To save patient data for transfer purposes:***

1. When you discharge a patient from a monitored bed, enter the ADT menu
2. Select **“Save & Discharge”** - this will store the patient information under a “ready for transfer” file - See Figure 9-4.
3. If you select the **“Discharge”** panel you have the option of either discharge without any storage or **“Save & Discharge”** as above.

Note: *The Full Disclosure data will be deleted and only Charts, Trends and Event strips are stored for transfer.*

Note: *To save Patient Data, the ADT panel must include at least a Patient ID or a Patient Name.*

The Data of up to 3 (10 with extended memory option) patients can be saved on each individual monitor.

If you save data for more than 3 (10 with extended memory option) patients, the saved data will be replaced on the basis of "First in First out" (FIFO).

➤ ***To remove saved patient data:***

1. Enter System Setup on the monitor in which the data was saved
2. Select " Remove Saved Patient" - a list of the saved patients is displayed
3. Select the patient and delete.

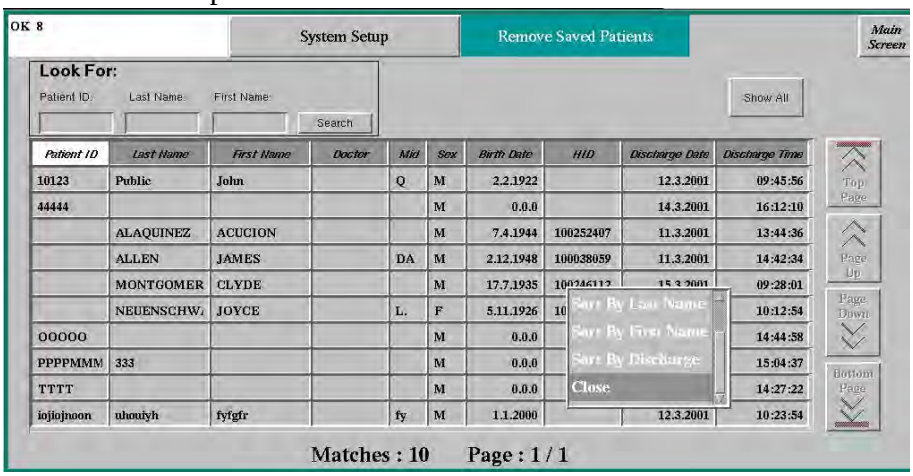


Figure 9-6: The Remove Patient Data Panel

➤ ***To transfer patient data from any monitor on the network:***

1. Open the ADT panel on the target monitor

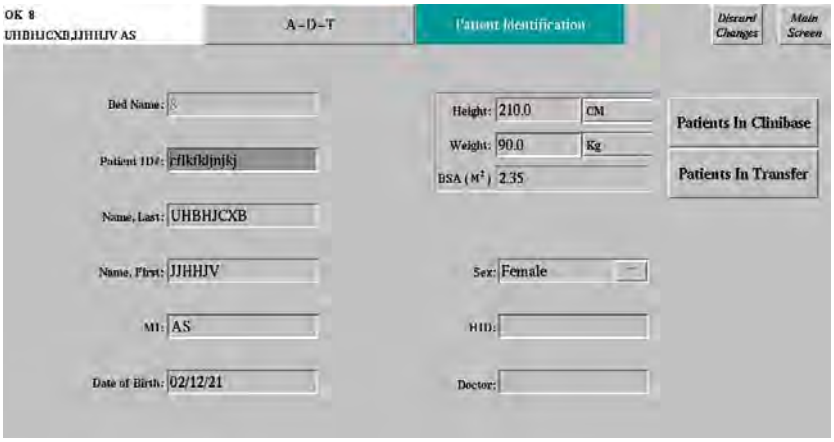


Figure 9-7: ADT Panel

2. Select “Patient in Transfer” key on the right side of the panel - a “Patients in Transfer” panel opens
3. Select the Unit from which the patient was released
4. A List of patients that have data stored for transfer on all monitors in the unit, is displayed.
5. Either select a patient or use the “Look For” boxes to find the patient

Note: *if you insert one or more letters into the name box, a sub list with all patients with the name beginning with the selected letters will be displayed.*

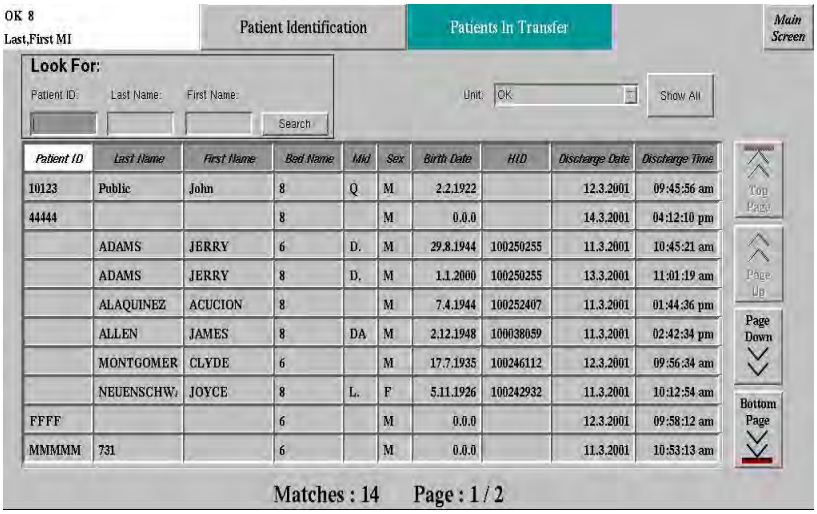

OK 8
Last,First MI
Patient Identification
Patients In Transfer
Main Screen
Look For:
Patient ID:
Last Name:
First Name:
Search
Unit: OK
Show All
Patient ID | Last Name | First Name | Bed Name | Mid | Sex | Birth Date | HID | Discharge Date | Discharge Time
10123 | Public | John | 8 | Q | M | 2.2.1922 | | 12.3.2001 | 09:45:56 am
44444 | | | 8 | | M | 0.0.0 | | 14.3.2001 | 04:12:10 pm
 | ADAMS | JERRY | 6 | D. | M | 29.8.1944 | 100250255 | 11.3.2001 | 10:45:21 am
 | ADAMS | JERRY | 8 | D. | M | 1.1.2000 | 100250255 | 13.3.2001 | 11:01:19 am
 | ALAQUINEZ | ACUCION | 8 | | M | 7.4.1944 | 100252407 | 11.3.2001 | 01:44:36 pm
 | ALLEN | JAMES | 8 | DA | M | 2.12.1948 | 100038059 | 11.3.2001 | 02:42:34 pm
 | MONTGOMER | CLYDE | 6 | | M | 17.7.1935 | 100246112 | 12.3.2001 | 09:56:34 am
 | NEUENSCHW | JOYCE | 8 | L. | F | 5.11.1926 | 100242932 | 11.3.2001 | 10:12:54 am
FFFF | | | 6 | | M | 0.0.0 | | 12.3.2001 | 09:58:12 am
MMMMM | 731 | | 6 | | M | 0.0.0 | | 11.3.2001 | 10:53:13 am
Top Page
Page Up
Page Down
Bottom Page
Matches : 14
Page : 1 / 2

Figure 9-8: Patients in Transfer Panel

Menntor X7 to HemoCis Interface

Introduction

The ***Menntor X7*** to HemoCis interface has three main functions:

- To **Admit** a patient from HemoCis
- To **Transfer** patient clinical data to HemoCis upon Discharge
- To open the **HemoCis window** on the ***Menntor X7*** – this requires Option 550-OPT-078 (License)

HemoCis Interface

The first function **Admit from HemoCis** can be performed from any ***Menntor X7*** that is on the same network as the HemoCis.

The second function **Transfer to HemoCis** is available only if the ***Menntor X7*** was defined as belonging to **Cathlab Suite**, and if the HemoCis is available on the network. See the **System Setup** for Cathlab Suite. This function is available only if the patient was admitted from the HemoCis.

To open a **HemoCis** window on the ***Menntor X7***, the ***Menntor X7*** must have Option 55-OPT-078 (Licence); also, you must add to the network a special hardware and software package named System Server 550-OPT-080. This function is available only if the patient was admitted from the HemoCis.

System Setup for Cathlab Suite

➤ ***To define an Menntor X7 monitor as a " Cathlab suite monitor ":***

1. Connect the HemoCis system to the same LAN as your **Cathlab suite** ***Menntor X7*** monitors
2. Connect a mouse and keyboard to each ***Menntor X7***
3. Enter the **System Setup** menu of each ***Menntor X7*** with the required password

4. Enter **Network Setup** and set "**Cathlab suite monitor**" to **On** (Green)

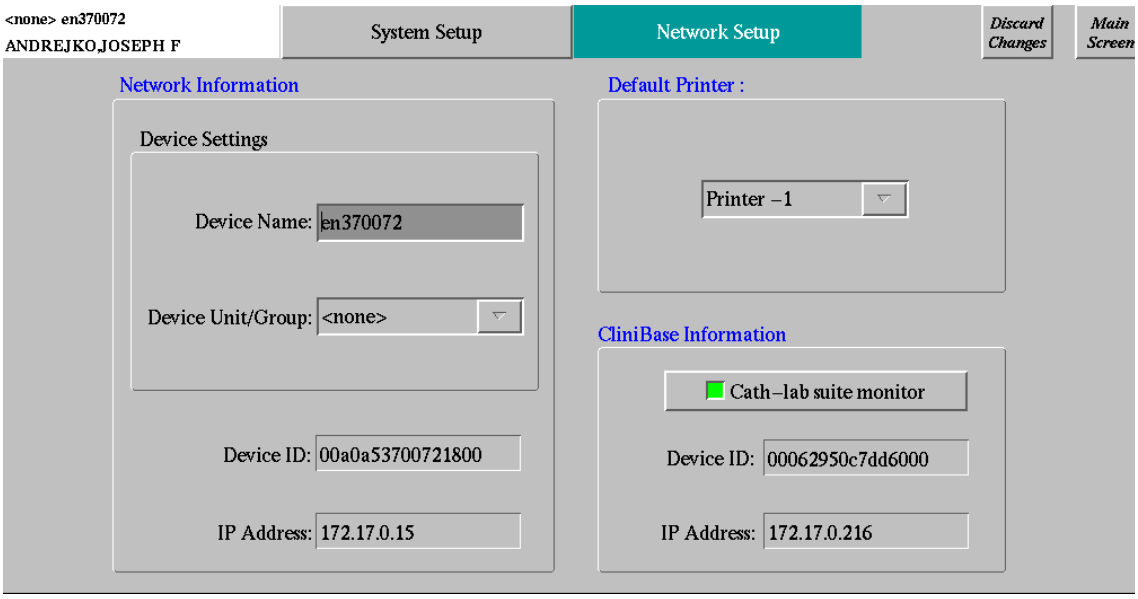
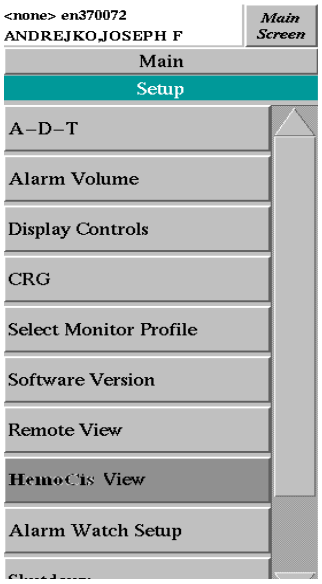


Figure 9-9: Network Setup

5. Use the **Shutdown** function in the **Setup** menu to restart the ***Menntor X7*** - this activates the mouse and the HemoCis window
6. A new item called **HemoCis View** appears in the Setup menu - this key toggles **Show** and **Hide** of the HemoCis window.

Figure 9-10: HemoCis View



Note: *We recommended that you prepare a* ***QuicKey*** *for "HemoCis View" to enable opening and hiding of the HemoCis window in one action.*

Admit from HemoCis

The Ensemble network system has an option for receiving patient data via

the network from the HemoCis Clinical Information System to an ***Menntor X7*** monitor.

The transferred data includes:

- Patient Demographic Information
- Cath-Lab Occurrence ID and
- Case ID.

➤ ***To transfer patient demographic data from the HemoCis to an Menntor X7 monitor on the network:***

1. Open the **Patient Identification** panel from the **ADT** menu on the target monitor

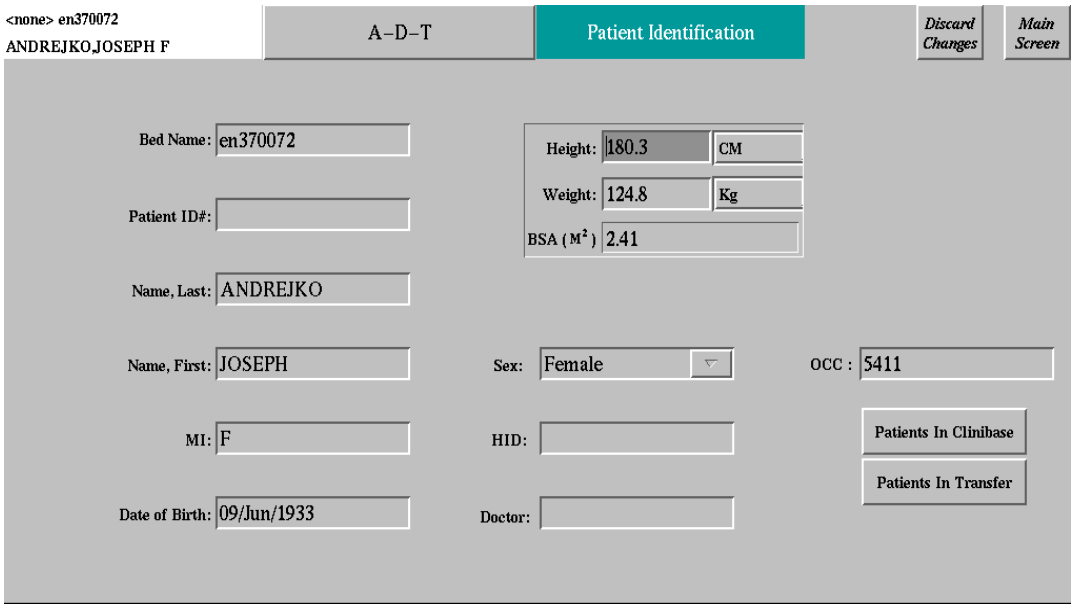


Figure 9-11: Patient Identification Panel

2. Select the **Patients in HemoCis** button on the right side of the panel - a panel of **Patients in HemoCis** opens and a list of patients scheduled for a procedure "today" is displayed

3. Either select a patient, or use the **Look For** boxes to find the patient according to the first letters of his name - use the **"Show All Patients"** button to show the complete list of patients in the HemoCis

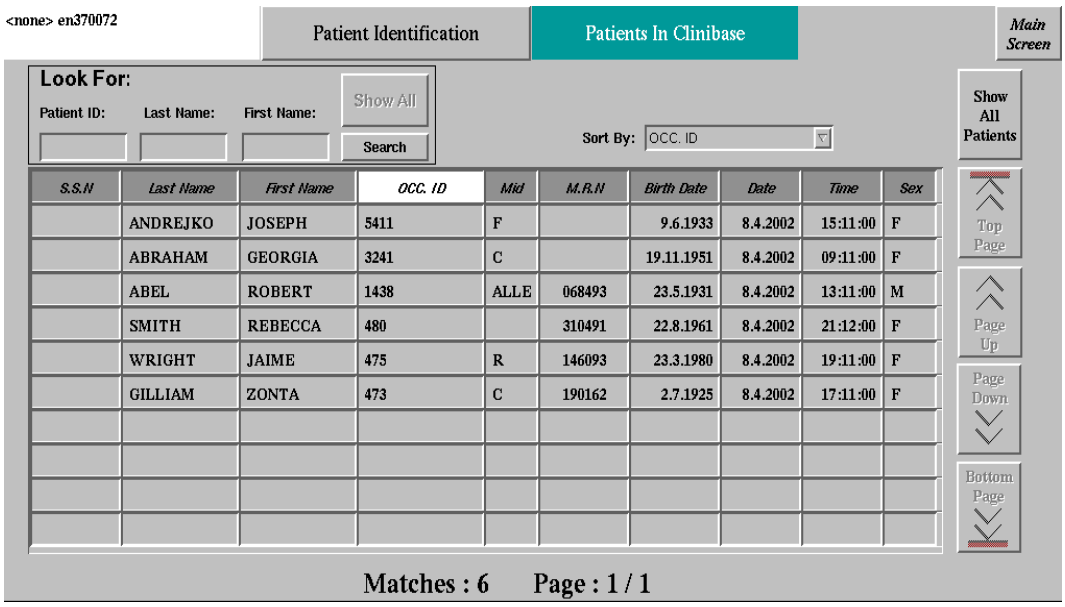

<none> en370072
Patient Identification
Patients In Clinibase
Main Screen
Look For:
Patient ID:
Last Name:
First Name:
Show All
Search
Sort By: OCC. ID
Show All Patients
Top Page
Page Up
Page Down
Bottom Page
S.S.N | Last Name | First Name | OCC. ID | Mid | M.R.N | Birth Date | Date | Time | Sex
ANDREJKO | JOSEPH | 5411 | F | 9.6.1933 | 8.4.2002 | 15:11:00 | F
ABRAHAM | GEORGIA | 3241 | C | 19.11.1951 | 8.4.2002 | 09:11:00 | F
ABEL | ROBERT | 1438 | ALLE | 068493 | 23.5.1931 | 8.4.2002 | 13:11:00 | M
SMITH | REBECCA | 480 | 310491 | 22.8.1961 | 8.4.2002 | 21:12:00 | F
WRIGHT | JAIME | 475 | R | 146093 | 23.3.1980 | 8.4.2002 | 19:11:00 | F
GILLIAM | ZONTA | 473 | C | 190162 | 2.7.1925 | 8.4.2002 | 17:11:00 | F
Matches : 6
Page : 1 / 1

Figure 9-12: Patients in HemoCis Panel

Note: *Transfer of the full list of patients from the HemoCis to the **Menntor X7** takes a long time. We therefore recommended that you schedule the patient/s for "Today" on the HemoCis **before monitoring starts.***

HemoCis View

To Open HemoCis window on Menntor X7 monitor

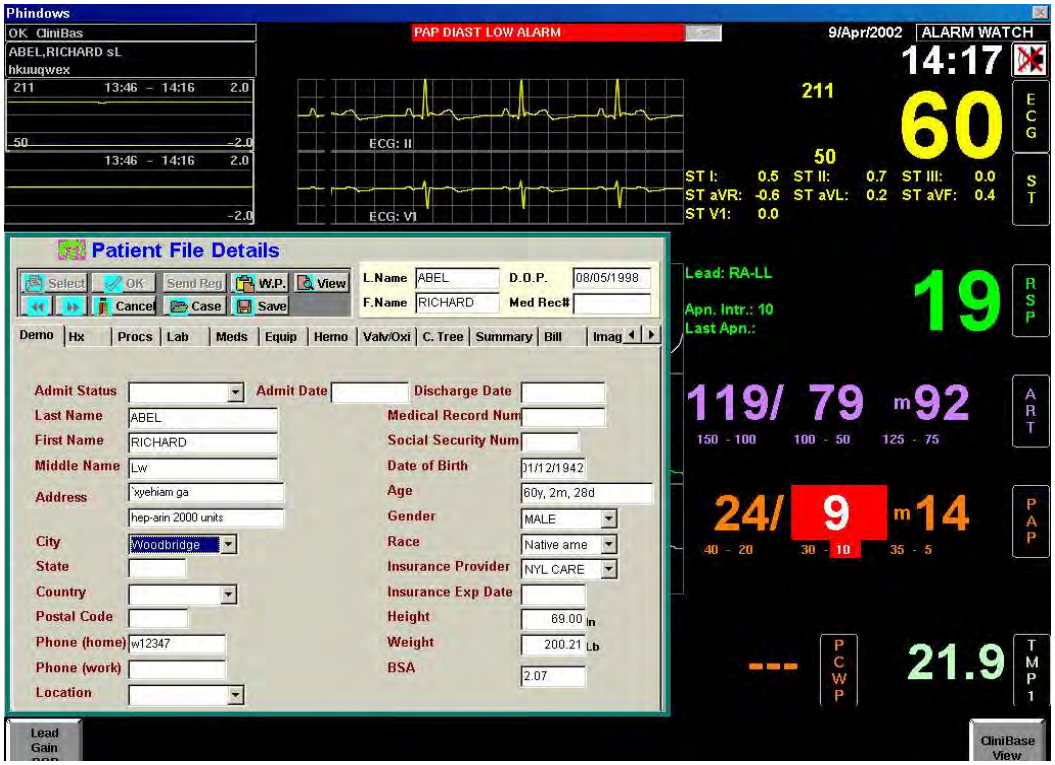


Figure 9-13: HemoCis window displayed on Menntor X7

➤ ***If the Menntor X7 is a Cathlab Suite monitor with Option 960-OPT-280 or 960-OPT-286 (HemoCis) (Licence), show the HemoCis window by doing one of the following:***

1. In Setup menu select **HemoCis View** - this key will toggle Show and Hide of the HemoCis window

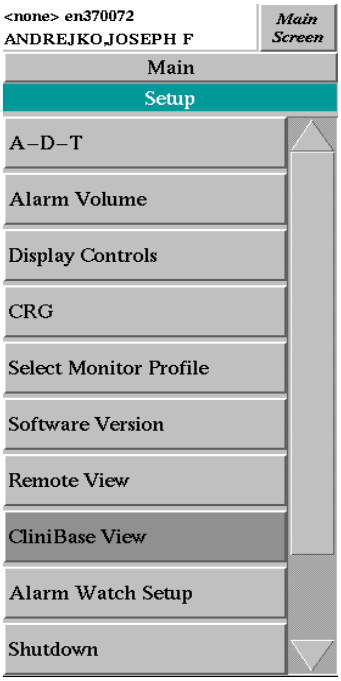


Figure 9-14: HemoCis View

2. If you defined a QuicKey for **HemoCis View,** use the QuicKey to toggle between show and hide
3. If the monitor is in either **Discontinue** or **Discharge,** the QuicKey is not available and you can only show or hide the HemoCis window via the **HemoCis View** key in the **Setup** menu

Transfer to HemoCis

To transfer patient clinical data to the HemoCis, the ***Menntor X7*** has to be defined in System Setup as: **Cathlab Suite monitor**.

➤ ***To define Menntor X7 monitor as: "Cathlab Suite monitor"***

1. Use password to enter System Setup >> Network Setup
2. In the HemoCis Information area , activate "Cath Lab Suite monitor" (Green)

If the ***Menntor X7*** was defined as **Cathlab Suite monitor**, the function of **Save & Discharge** will change to **Send, Save and Discharge**. The ***Menntor X7*** will send its clinical patient file to the HemoCis under the patient's Occurance ID provided by the HemoCis when the patient is admitted from the HemoCis.

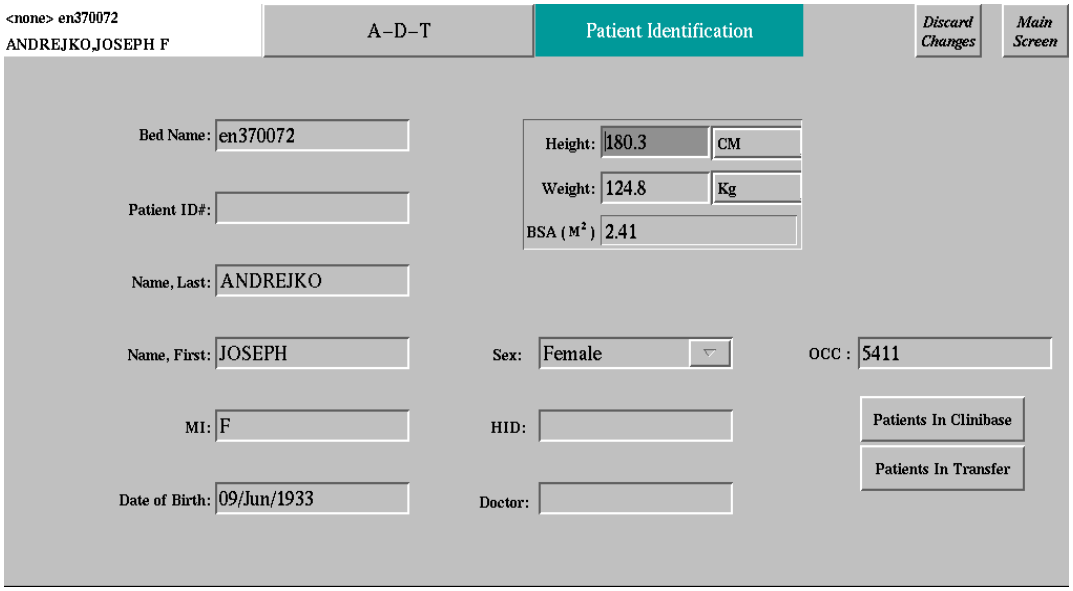


Figure 9-15: Patient Occuence ID

➤ ***To transfer Menntor X7 clinical data to HemoCis***

1. When you discharge a patient from a monitored bed in Cath Lab suite , enter the ADT menu
2. Select **"Save & Discharge"** - this will send (transfer) the clinical data from the ***Menntor X7*** to the HemoCis and also store the patient information in the ***Menntor X7*** under a **Ready for Transfer** file - See Figure 9-4.
3. If you select the **"Discharge"** panel you have the option of either discharge without any storage or **"Save & Discharge"** as above.

Note: *The Full Disclosure data will be deleted and only Charts, Trends and Event strips are Sent to HemoCis and stored for transfer.*

Note: *To send (transfer) Patient Data, the patient must be admitted from Clinicase and the ADT panel must include the Occurance ID received during patient admission from the HemoCis.*

4. If the patient was not admitted from the HemoCis, selecting **Save & Discharge** opens a modified **Save & Discharge panel.** Selection of the **"Discharge"** panel opens a modified **Discharge** panel.

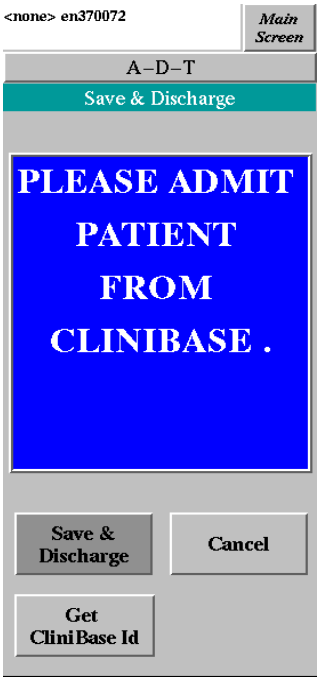


Figure 9-16: Save and Discharge

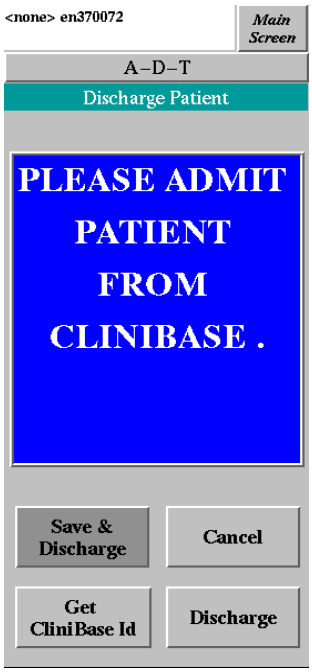


Figure 9-17: Discharge Panel

5. You now have the option to return to the **ADT** panel by pressing **Get HemoCis ID** or **Discharge** or **Save & Discharge** without transfer to the HemoCis.

Setting up Monitoring Profiles

When admitting a patient, the admitting staff member must define which vital signs to monitor and how those parameters appear on the main screen display. In order to simplify this process, the monitor can be configured with pre-defined Monitoring Profiles which include all definitions necessary for admitting various types of patients, such as adult, pediatric, geriatric, etc. Monitoring Profiles make it possible to prepare standard patient monitoring profiles allowing staff to connect a patient quickly without having to first configure the ***Menntor X7*** (or at least to reduce configuration to a minimum).

Up to 12 Monitoring Profiles can be configured for use in the ***Menntor X7***. This includes 11 user-defined Monitoring Profiles and one default **Admit as Previous** key that saves the settings defined for the previous patient monitored by the unit. Only those Monitoring Profiles defined for use in the unit appear on the display screen.

You can set up Monitoring Profiles while monitoring an actual patient, or you can start the ***Menntor X7*** without actually connecting a patient, set up monitoring parameters and then save them as an Monitoring Profile.

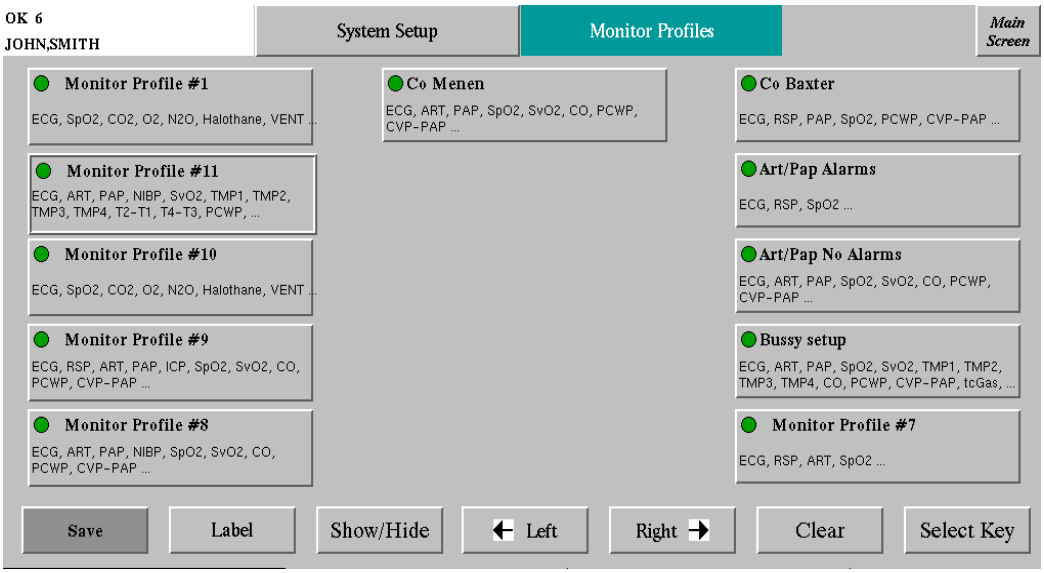

OK 6
JOHN,SMITH
System Setup
Monitor Profiles
Main Screen
Monitor Profile #1
ECG, SpO2, CO2, O2, N2O, Halothane, VENT ...
Co Menen
ECG, ART, PAP, SpO2, SvO2, CO, PCWP, CVP-PAP ...
Co Baxter
ECG, RSP, PAP, SpO2, PCWP, CVP-PAP ...
Monitor Profile #11
ECG, ART, PAP, NIBP, SvO2, TMP1, TMP2, TMP3, TMP4, T2-T1, T4-T3, PCWP, ...
Art/Pap Alarms
ECG, RSP, SpO2 ...
Monitor Profile #10
ECG, SpO2, CO2, O2, N2O, Halothane, VENT ...
Art/Pap No Alarms
ECG, ART, PAP, SpO2, SvO2, CO, PCWP, CVP-PAP ...
Monitor Profile #9
ECG, RSP, ART, PAP, ICP, SpO2, SvO2, CO, PCWP, CVP-PAP ...
Bussy setup
ECG, ART, PAP, SpO2, SvO2, TMP1, TMP2, TMP3, TMP4, CO, PCWP, CVP-PAP, tcGas, ...
Monitor Profile #8
ECG, ART, PAP, NIBP, SpO2, SvO2, CO, PCWP, CVP-PAP ...
Monitor Profile #7
ECG, RSP, ART, SpO2 ...
Save
Label
Show/Hide
Left
Right
Clear
Select Key

Figure 9-18: The Monitoring Profiles Panel

Monitoring Profiles are defined in the Monitoring Profiles panel which can be accessed from the Setup menu. The keys are displayed on the panel in the order in which they appear on the ***Menntor X7*** screen when admitting a patient. Any defined Monitoring Profiles are labelled with their defined name and monitoring parameters.

➤ ***To set up a new Monitoring Profile:***

1. Set up the monitoring parameters you want according to the instructions in the Vital Signs Monitoring section.
2. From the Main menu select the Setup key and select **Monitoring Profiles** from the **Setup** menu. The **Monitoring Profile** panel is displayed.
3. Press **Select Key**.
4. Select an available key. A frame appears around the key and the buttons along the bottom of the panel become available.
5. Click **Save**.

➤ ***To name a new Monitoring Profile:***

1. In the **Monitoring Profiles** panel, press **Select Key**.
2. Turn the QuicKnob™ and press an available key

3. Press **Label**. The alphanumeric keyboard panel appears.
4. Enter the text for the label and press **Accept**.

Showing/Hiding the Monitoring Profile on the Main Screen

Once you have defined a Monitoring Profile, you can also determine whether it is available for use when admitting a new patient. A green bullet appears next to those Monitoring Profiles that are set to appear on the main screen.

➤ ***To show or hide the Monitoring Profile:***

1. In the **Monitoring Profiles** panel, press **Select Key**.
2. Select the required Monitoring Profile. A frame appears around the key indicating that it is selected.
   - If no bullet appears in the label, press **Show/Hide**. The green bullet appears and the Monitoring Profile will appear on the main screen the next time you want to admit a patient.
   - If a green bullet appears in the label, press **Show/Hide**. The bullet disappears and the Monitoring Profile is removed from the main screen.

Changing the Position of a Monitoring Profile

The Monitoring Profiles are arranged on the Monitoring Profile panel in the positions where they will appear on the main screen. The keys can be moved to any position that is most convenient for you.

➤ ***To move an Monitoring Profile:***

1. In the **Monitoring Profiles** panel, press **Select Key**.
2. Turn the QuicKnob™ and press the key you want. A frame appears around the key, indicating that it is selected.
3. Press **Right** to move the selected Monitoring Profile clockwise
   – or –
   press **Left** to move the key counterclockwise.

Clearing a Monitoring Profile

A previously defined Monitoring Profile may no longer suit your monitoring needs. In that case you can simply clear the Monitoring Profile from the ***Menntor X7***.

➤ ***To clear a Monitoring Profile:***

1. In the **Monitoring Profiles** panel, press **Select Key**.

2. Turn the QuicKnob™ until you reach the key you want to clear and press. A frame appears around the selected key.
3. Press **Clear**. The Monitoring Profile is removed from the **Monitoring Profiles** panel and will no longer appear on the main screen when admitting a patient.

CHAPTER 10:
REVIEWING PATIENT DATA

The **Patient Data** menu contains options that enable you to review patient data stored in the ***Menntor X7*** in different formats. These options include Trends, ST Watch, Charts, Full Disclosure and Overview.

Note: *The amount of data that can be stored depends on the capacity of the Flash card used. Table 10-1 provides information from the Specification*

Table 10-1: Amount of data stored according to Flash card capacity

Storage	*8GB*	*16GB*	*32GB*
Tabular Chart	**80 days**	**80 days**	**80 days**
Graphic Trend	**80 days**	**80 days**	**80 days**
Full discloser	**~5 Days**	**>8 Days**	**>8 Days**
Overview	**~5 Days**	**>8 Days**	**>8 Days**
Event Strip	**75**	**75**	**75**
aEEG	**Not supported**	**8 Days**	**8 Days**
aEEG Sections	**Not supported**	**50**	**50**
Saved Patient	**10**	**10**	**10**
aEEG Saved Patient	**Not supported**	**3**	**8**
MPM storage time	**~5 HR**	**~5 HR**	**~5 HR**
MPM saved file	**3**	**3**	**3**

CAUTION! *The duration of patient data storage in Chart and Trend is limited by the size of the processor memory. When the memory is full, the monitor stops storing data in Chart and Trend and the warning message "**No Space for Data Storage**" appears on a red background at the bottom of the monitor panel. On the discharge panels a warning panel appears, requesting to discharge the patient and re-admit.*

*Use **Save & Discharge** to save Trend, Chart and Event strips.*
***Save & Discharge** deletes all Full Disclosure data.*

Figure 10-1: Warning on Memory Full

Trends

The Trends feature enables you to review data as a graphic representation.

Trends represent changes in vital signs over time. Comparing the patterns of change gives an indication of the patient's progress.

All vital sign data are available for trending. Up to eight vital signs can be trended and displayed at one time on two axes. The vital signs can be selected individually or as a related group from the total set available.

The ***Menntor X7*** can store up to 80 days of trend data. Trend display duration times available for selection are 30 min., 1hr., 2 hrs., 3 hrs., 4 hrs., 6 hrs., 8 hrs., 12 hrs. and 24 hrs.

A time on a trend can be selected and the actual readings reviewed. The ***Menntor X7*** enables you to zoom in and out of a segment of any length trend, condensing or expanding the time displayed. You can also select a segment of a trend and hold and compare it to the other segments of the trend.

The Trend Display panel displays markers in the three top lines of the Trend panel as follows:

Top line: ECG Artifact .- Marked by a violet pixel.

Middle line: Alarm of any of the parameters is marked in red.

"ECG Alarms Off" is marked in blue.

Lower line: Event (Manual, C.O., NIBP and PCWP) - Marked by a blue pixel.

Note: *The above markers will be activated only when the HTR trend is active.*

Figure 10-2: The Trends Panel

➤ ***To operate the Trends Display panel:***

1. From the Main menu select the **Patient Data** key to access the **Patient Data** menu.
2. From the **Patient Data** menu
   –or–
   When the **Patient Data** panel is already displayed, from the drop-down menu below the panel title, select **Trends**.
3. Select up to four or eight vital sign parameters, one from each of the colored **Parameter** drop-down lists. The selected parameters appear on the graph in the color of the drop-down list from which they were selected.
4. From the **Duration** drop-down list, select a duration time for the trend.

5. Toggle the **1 Axis** button to display up to 4 parameter trends of the vital signs; Toggle the **2 Axes** button to display up to 8 parameter trends of the vital signs.
6. Press the **Autoscale** button to autoscale the displayed section.
7. Press **Scroll Right** to scroll the trend display forward and **Scroll Left** to scroll the trend display backward in steps of one-third of the trend duration. For example, if the trend duration is two hours, pressing Scroll Right scrolls the trend forward by 40 minutes.
8. To hold a segment of the trend, do the following:
    a. Enable the cursor and place it at the center of the segment (see Step 11).
    b. Use the QuicKnob™ to select and press **Mark Hold Segment -** a line marking the selected time interval appears on top of the cursor.
    c. Use the QuicKnob™ to increase or decrease the marked area.
    d. Press the center key (H) of **Mark and Hold** to hold the selected section.
    e. The graph area splits into two sections. The right section contains the whole trend and the left section contains the selected segment. The **Mark Hold Segment** button changes to **Clear Hold.**
9. To release the segment, press **Clear Hold**. The graph area returns to normal.
10. Use the **Zoom in/Zoom Out** keys to change the duration of the trend around a fixed cursor time.
11. Use the QuicKnob™ to select and press the **Cursor** button.
12. Rotate the QuicKnob™ to move the **Cursor** to the left or right.
13. Press the QuicKnob™ to release the **Cursor** button.
14. Press the **Grid** button to add or remove the grid of the trend panel.
15. To display the trend starting at a selected time and date, press **Go to**. The **Date & Time** panel opens (Figure 10-3). Select the date and time and click **Accept.**

Figure 10-3: Date & Time Panel

16. From the **Patient Data** drop-down menu, select **Charts**, **Full Disclosure** or **Overview**. The **Trends** panel closes and the selected panel opens displaying data for time synchronized to the last cursor location in the **Trends** panel.
17. Click **Main Screen** to return to the main screen display.

ST Watch

ST Watch panel enables you to review ST data as a graphic representation.

ST Watch represent changes in ST trend over time. Comparing the QRS patterns of change gives an indication of the patient's progress.

All ST leads are available for trending. Up to three ST leads and one calculated ST average or sum value can be trended and displayed at one time on four axes. The ST leads for each of the axes can be selected individually

The ***Menntor X7*** can store up to 10 days of ST trend data. Trend display duration times available for selection are 30 min., 1hr., 2 hrs., 3 hrs., 4 hrs., 6 hrs., 8 hrs., 12 hrs. and 24 hrs. A time on a trend can be selected and the actual readings reviewed.

The actual ECG waveform at each time point can be viewed and compared with up to three reference waveforms. The user can mark events on the ST trend curves, and calculate the area under the calculated ST average or sum curve for periods of one or more hours.

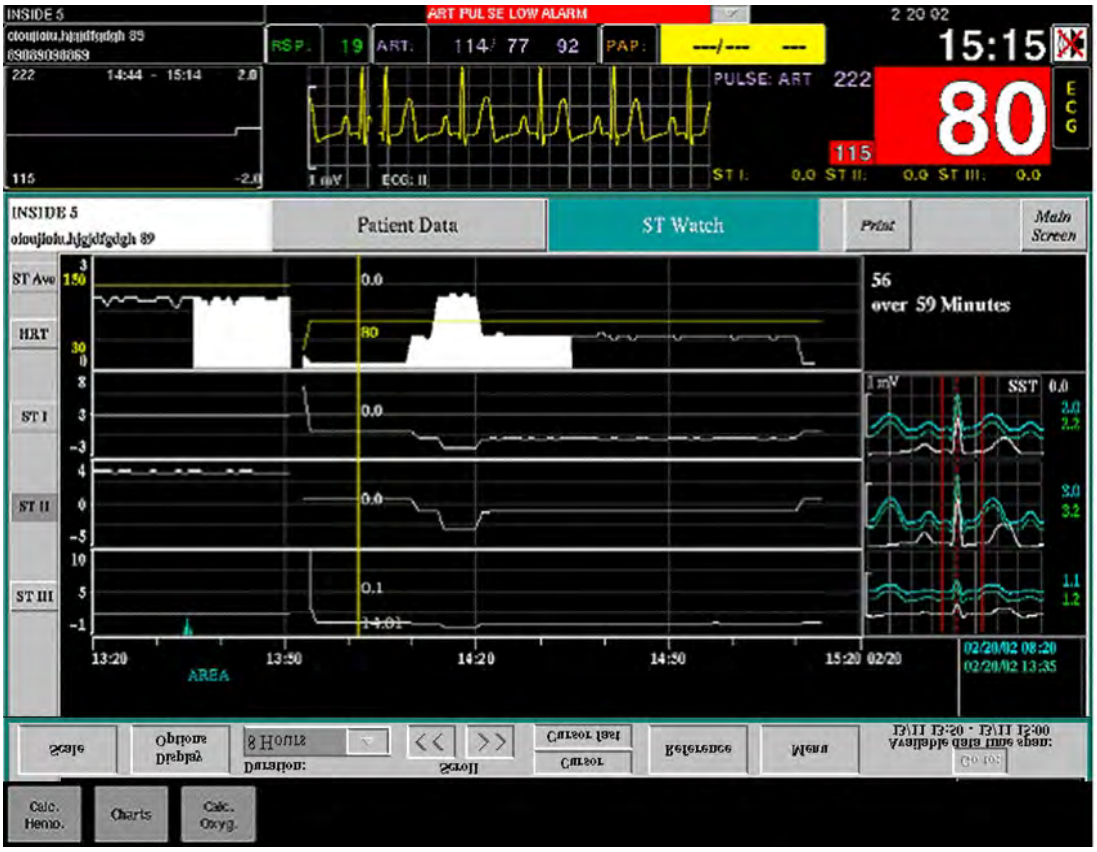


Figure 10-4: ST Watch Panel

Panel Description

The panel consists of a **Central** trend area and of a Frame.

The **Central** area has four trend graph areas:

- SST and HRT trend area
- Three ST trend areas for three ST leads

The area under the trend areas is used for time markers, and event information.

The area on the right is divided into three boxes :

1. Area box on top
2. Waveform box that shows reference ECG and ECG at cursor location
3. Reference time box

The **Frame** is divided to the Top strip, Left strip, and Bottom Strip.

The **Top** strip includes:

- Bed and Patient name
- Patient Data menu key
- The panel name
- Print key
- Main Screen key

The **Left** strip includes three ST lead selection keys and SST selection key.

The **Bottom** strip is the main control strip and consists of the following keys:

- **Scale**
- **Display Option**
- **Duration**
- **Scroll** keys
- **Cursor** keys
- **Reference** setting key
- **Menu** key
- **Go to** key

➤ ***To operate the ST Trend Display panel:***

1. From the Main menu select the **Patient Data** key to access the **Patient Data** menu.
2. From the **Patient Data** menu
   –or–
   When the **Patient Data** panel is already displayed, from the drop-down menu below the panel title, select **ST Watch**.
3. Select up to three ST leads. The selected ST leads appear each in separate display area.
4. Use the QuicKnob™ to reach the ST lead selection box. Press the QuicKnob™ to get the list of available leads, and select the required lead.
5. SST, a calculated Average or Sum ST is displayed together with HRT trend is displayed on the top display area. You can select either:

- None
- STave --- Average of absolute ST value for all leads
- STsum --- Sum of absolute ST value for all leads
- STVM --- ST vector magnitude (Available only with 12 lead ECG)

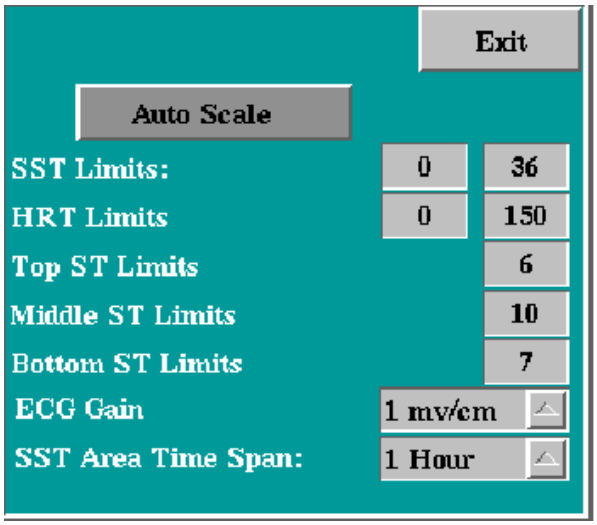


Figure 10-5: ST Watch Scale Panel

6. Select the **Scale** to set the scales for the different trend display areas.

- Press the **Autoscale** button to autoscale the displayed section.

Set the SST scale limits

Set the HRT scale limits

Set the limits for the Top, Middle, and Bottom ST leads scale limits

Set ECG gain (Default 1 mV/cm - Nominal)

Set SST AREA time span between 1 and 8 hours

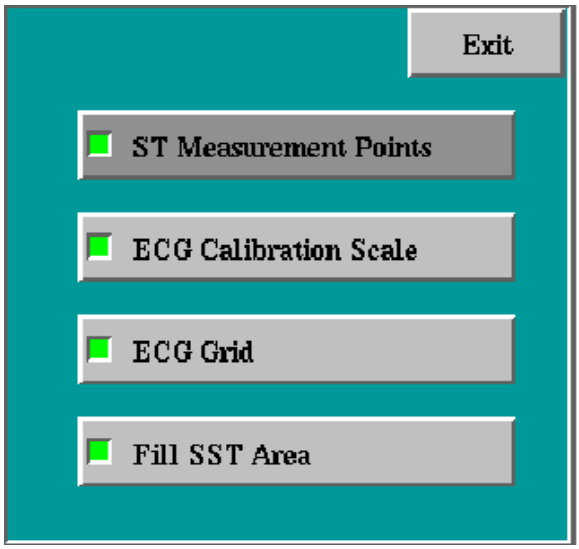


Figure 10-6: ST Watch Display Option Panel

7. Select **Display Options.** A panel with toggle keys is opened

- ST measurement Points will effect the ECG Waveform area and will show
- lines at the Isoelectric and ST measuring points
- ECG Calibration Scale will appear in the ECG Waveform area
- ECG Grid in the ECG Waveform area
- Fill SST Area will effect the SST trend curve

8. From the **Duration** drop-down list, select a duration time for the ST trend, between 1 and 8 hours

9. Press **Scroll Right** to scroll the trend display forward and **Scroll Left** to scroll the trend display backward in steps of one-third of the trend duration. For example, if the trend duration is two hours, pressing Scroll Right scrolls the trend forward by 40 minutes.

10. Use the QuicKnob™ to select and press the **Cursor** button.

    The cursor will enable you to :

- View the ST values at the Cursor point

- Set references and Events, including setting of start point for Area measurement
- Show the ECG waveform at the Cursor point

Note: *the ECG waveform is taken from the Full Disclosure and thus will be available only if the cursor is set on a point of time at which Full Disclosure is available. Note that the Full Disclosure is limited to 6 hours (5 days for extended memory).*

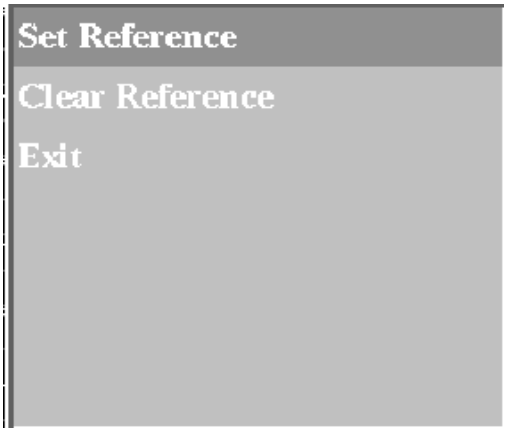


Figure 10-7: ST Watch Reference Panel

11. Rotate the QuicKnob™ to move the **Cursor** to the left or right
12. Either fast or slow movement are available for the Cursor movement
13. **Reference** key will enable you to select up to three reference ECG waveforms.:

- Set Reference at the location of the Cursor. The ECG reference waveform will appear in color in the ECG waveform box.
- Clear Reference
- Exit

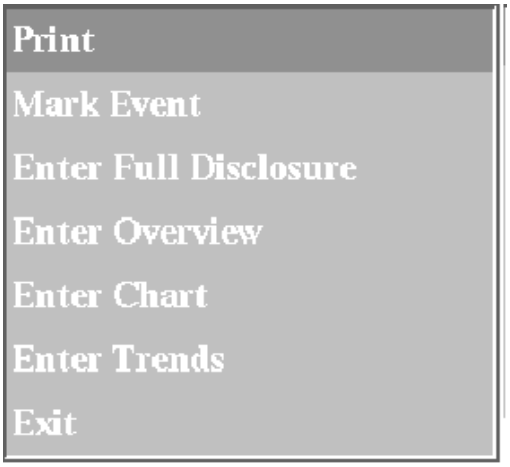


Figure 10-8: ST Watch Menu Panel

14. **Menu** key will open a menu with the following functions:

- Print the ST Watch Panel
- Mark Event
- Enter Full Disclosure, or Overview, or Chart, or Trend
- Exit

15. To display the ST trend starting at a selected time and date, do the following:

    Press **Go to**, then **Date** and the **Time**, and then once again press **Go to.**

16. **From the Patient Data** drop-down menu, select **Charts**, **Full Disclosure** or **Overview**. The **ST** t**rends** panel closes and the selected panel opens displaying data for time synchronized to the last cursor location in the **ST Watch** panel.

17. Press **Main Screen** to return to the main screen display.

STS Area Calculation

The ST Watch feature enables the user to measure the **Area** under the ST Sum, ST Ave or STVM Trend Curve.

Duration of area calculation

Use the Scale panel to select the duration of the **Area** calculation, between 1 and 8 hours.

Starting point

Set the starting point for **Area** calculation by creating an Event with a name starting with the letters: AREA . For example: “AREA” or “AREA1” or “AREA Treatment”

The **Area** under the curve will be calculated in units of [mm x minute].

It is possible to mark several area sections (not overlapping).

View **Area** calculation results

To view the **Area** you have to insert the cursor into the area of integration.

The value of the **Area** displayed will be for the whole period of integration either as set in the scale panel, or if the integration time has not ended, for the actual integration time. If more than one **Area** was defined, the display will present the **Area** of the section were the cursor if located.

Charts

A chart is a tabular representation of the patient’s condition. The ***Menntor X7*** enables you to review data in the same way as data recorded on a chart by a nurse. The charts can be reviewed, printed, and placed in the patient’s hospital file, eliminating the need to copy data from a screen or printed page.

Chart Storage

The ***Menntor X7*** can store up to 10 days of numeric data. It supplies a set of charts for data acquisition, clinical calculations and review. It adds entries to the charts every minute, whenever an event is detected and on request.

All entries are stored for the entire hospitalization period. Once a patient is discharged, all stored data is removed.

Chart entries contain five types of fields:

- Vital sign values
- ST values
- Calculated fields
- Medication
- Ventilator
- Anesthetic Gas

Date and time are included in each chart entry.

Chart Types

The following two types of charts are available:

1. **Calculation Chart -** includes the following:

- Respiration
- Oxygenation
- Hemodynamics
- Renal
- Medication

Calculation Chart entries can be edited.

2. **User defined charts**

   Up to 10 User defined charts can be defined in System Setup from the field types above. The names of all User defined charts appear in the list of charts in the Charts panel.

Viewing Charts

Any chart appearing on the list of available charts can be viewed in the **Charts** panel.

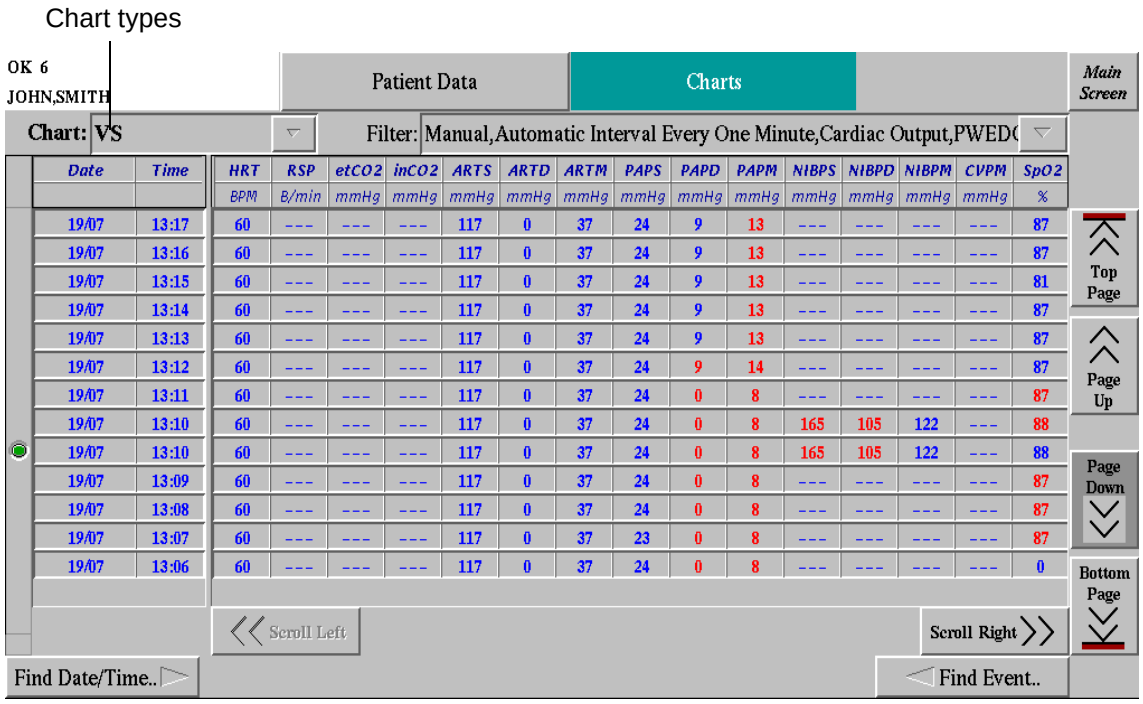


Figure 10-9: The Charts Panel

Chart entries are sorted by date and time. The most recent entries appear first. You can set the time resolution to one of the following values: 1 min., 2 min., 5 min., 10 min., 15 min., 30 min., 1 hr., and 2 hr. The default time resolution is 10 minutes.

Each chart entry contains a time stamp and a status field as well as other relevant data. The time stamp appears in date and time format. The time is displayed in hours and minutes. The status field contains the reason the event is being entered on the chart (i.e., alarm event, manual entry, etc.). Entries made at pre-configured time intervals are displayed with an empty status field. Each field may be displayed in a particular color or may be underlined. These features represent different attributes:

Feature	***Attribute***
Blue	Normal value
Red	Value during a clinical alarm
Green	Value during a technical alarm
Black	User modified field
Underlined	Part of deleted entry
- - - -	Value out of range

Each chart entry includes all vital sign values at the time of entry. Entries are added to a chart according to the following filters:

- Manual. Chart entries based on a manually selected event.
- Alarm. Chart entries when an alarm is triggered.
- Cardiac Output. A chart entry each time a cardiac output reading occurs.
- PCWP. A chart entry each time a pulmonary wedge reading occurs.
- NIBP. A chart entry each time a NIBP reading occurs.
- CVP. A chart entry each time a VCP reading from the PAP channel occurs.
- Apnea. A chart entry each time an apnea event occurs.
- Time Interval. Chart entries based on a defined time interval.

➤ ***To operate the Charts panel:***

1. From the Main menu select the **Patient Data** key to access the **Patient Data** menu.
2. From the **Patient Data** menu
   –or–
   When the **Patient Data** panel is already displayed, from the drop-down menu below the panel title, select **Charts**.

3. From the **Filters** drop-down list, select filters.
4. To access a specific entry based on when it took place, press **Find Date/Time** and enter the required date and time in the **Date** and **Time** panels.
5. To access a specific entry based on event type, press **Find Event** and select an event from the drop-down list. A chart appears containing occurrences of the selected event with the most recent occurrence appearing on the top line.

Note: *The following event types are available: Manual, Automatic (Alarms), Cardiac Output, PCWP, NIBP, CVP (from PAP), Apnea, Timer, Discontinue, Resume.*

6. Press **First Page** to display the first page of the chart.
7. Press **Last Page** to display the last page of the chart.
8. Press **Previous Page** to display the previous page.
9. Press **Next Page** to display the next page.
10. Use the scroll bar to move the chart left or right. The date and time remains the same while scrolling the data.
11. From the **Patient Data** drop-down menu, select **Trends**, **Full Disclosure** or **Overview**. The **Charts** panel closes and the selected panel opens displaying data for the time displayed on the top line of the **Charts** panel.
    –or–
    Turn the QuicKnob™ until an entry on the chart is highlighted and press. A drop-down menu opens. Select **Trends**, **Full Disclosure** or **Overview** to close the Chart panel and open the selected panel or click **Delete** to delete the chart entry.
12. Press **Main Screen** to close the panel and return to the main screen display.

Full Disclosure

Full Disclosure enables you to review a patient's ECG waveforms with associated data for at least 6 hours (5 days for extended memory), depending on the configuration of your system.

Full Disclosure features a Ten Minute Display panel that presents a snapshot of the waveform activity for a selected ECG lead over a specified ten minute period.

Zoom in on any ten second period on the Ten Minute Display panel to open the Ten Second Display panel. This panel presents a snapshot of waveform activity for all monitored ECG leads during the selected ten seconds. It also presents the following data for the selected time frame:

- RR intervals between beats in milliseconds
- Type of QRS complex
- List of alarms that were activated during that time period, including the time the alarm started.

Ten Minute Display Panel

The Ten Minute Display panel presents a snapshot of the waveform activity for any selected ECG lead over a specified ten minute period.

The time period initially displayed depends on the way you access Full Disclosure. When Full Disclosure is accessed directly from the **Patient Data** menu, the current system time rounded to the next ten minutes is used as the end time.
When Full Disclosure is accessed from another **Patient Data** panel (such as Charts), the time period under review in that panel is used as the start time.

When accessing the Ten Minute Display panel for the first time, it displays by default the waveform for the top-most ECG lead currently shown on the main display screen.

➤ ***To access the Ten Minute Display panel:***

1. From the Main menu select the **Patient Data** key
   –or–
   If a **Patient Data** function key appears on the main screen, turn the QuicKnob™ until the **Patient Data** key is highlighted and press to access the **Patient Data** menu.
2. From the **Patient Data** menu
   –or–
   When the **Patient Data** panel is already displayed, from the drop-down menu below the panel title, select **Full Disclosure** to access the **Ten Minute Display** panel.

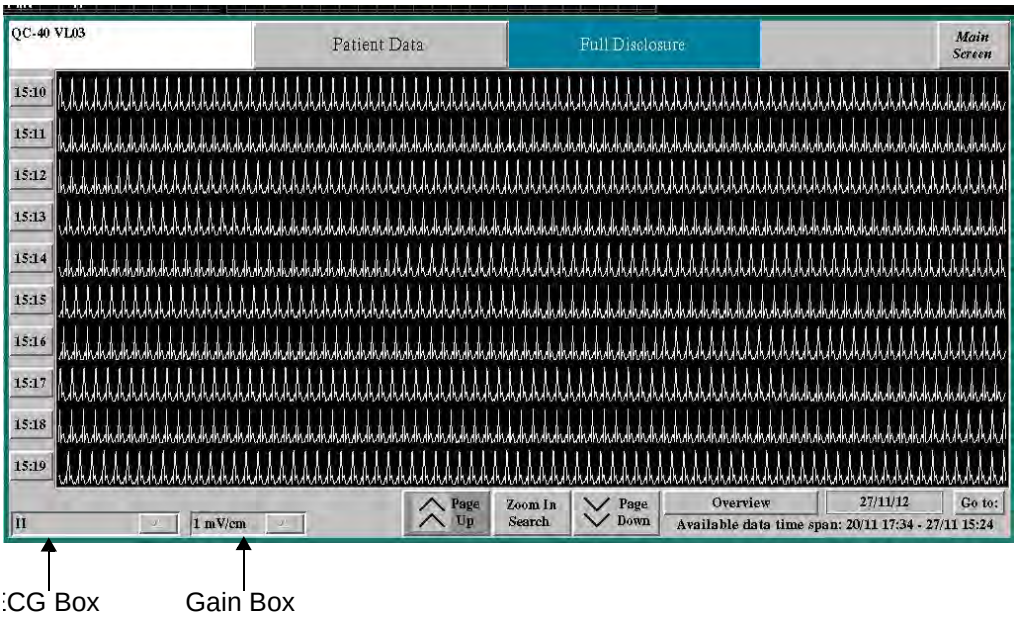


Figure 10-10: The Ten Minute Display Panel

The waveform for the lead listed in the ECG box is presented over ten lines of one minute each. The gain factor for the display appears in the Gain box.

The waveforms are color-coded to help you easily locate areas where alarms were triggered. White indicates no alarms were triggered. Green indicates a technical alarm and red indicates a clinical alarm.

The Date and Time boxes present the date and start time of the waveform.

The time span of the patient's waveform data as stored in the ***Menntor X7***'s memory appears in the bottom right corner of the panel.

- ***To operate the Ten Minute Display panel:***

1. To change the displayed lead, select a different lead from the **ECG** drop-down list.
2. To change the gain factor of the display, select a different factor from the **Gain** drop-down list. Available options are 1mv/cm and 2mv/cm.
3. To scroll forward ten minutes, press **Page Up**.
4. To scroll back ten minutes, press **Page Down**.

5. To view the waveform of a specific ten minute period, press **Go To** and enter the required date in the **Date** dialog panel and start time in the **Time** dialog panel. Make sure the required date and start and end times fall within the time span of stored data.
6. To zoom in on a specific ten second period, either press **Zoom In** and use the QuicKnob™ to move the cursor forwards or backwards; or use the QuicKnob™to select one of the minute keys on the left of the Full Disclosure panel.
   The cursor appears as a rectangle framing ten seconds of the displayed waveform. When the desired ten second period is located, press the QuicKnob™.
7. The following list of options will open:
   - Zoom in
   - Mark event
   - Print
   - Overview
   - Chart
   - Trend
   - Cancel
8. To access the **Ten Second Display** panel, select it and press Zoom in.
9. From the list above or from the **Patient Data** drop-down menu, select **Charts**, **Trends** or **Overview**. The **Ten Minute Display** panel closes and the selected panel opens displaying data for the time frame displayed in the **Ten Second Display** panel.
10. To exit the **Ten Minute Display** panel and return to the main screen display, press **Main Screen**.

Ten Second Display Panel

The Ten Second Display panel presents a snapshot of the waveform activity for all monitored ECG leads over a specified ten second period.

Statistical data for the ten seconds under review appear below the waveforms. To access the Ten Second Display panel:

1. From the Main menu select the **Patient Data** key
   –or–
   If a **Patient Data** function key appears on the main screen, turn the QuicKnob™ until the **Patient Data** key is highlighted and press to access the **Patient Data** menu.
2. From the **Patient Data** menu
   –or–
   When the **Patient Data** panel is already displayed, from the drop-down menu below the panel title, select **Full Disclosure** to access the **Ten Minute Display panel**.
3. Press **Zoom In** and use the QuicKnob™ to move the cursor to the ten second time period you want to view in detail.
4. Press the QuicKnob™ to access the **Ten Second Display Panel**.

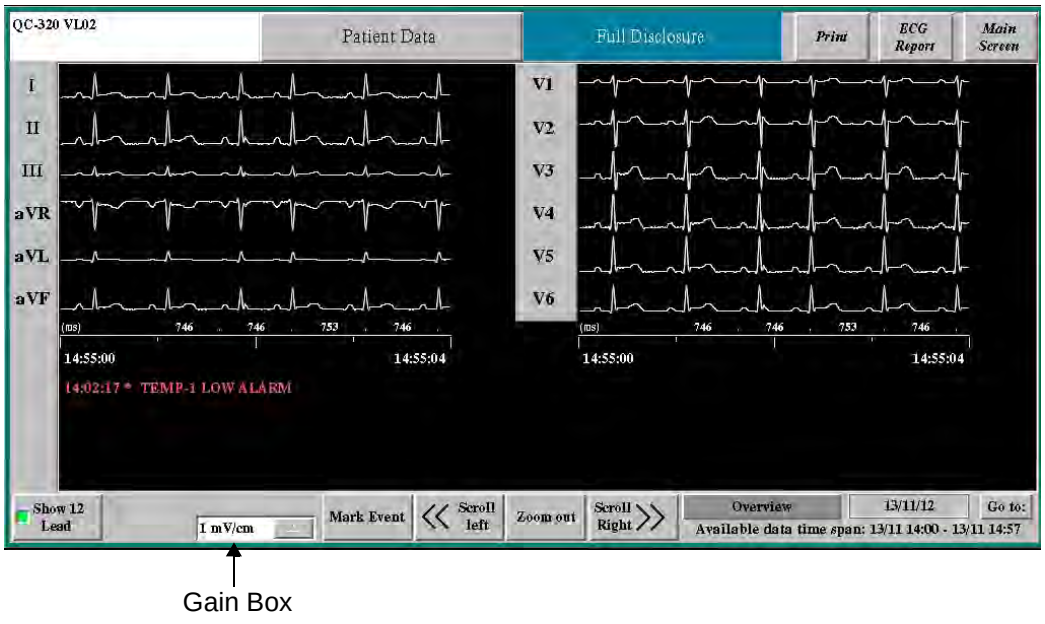


Figure 10-11: The Ten Second Display Panel

The Ten Second Display panel presents the waveform for each monitored lead over a specified ten second period of time. The gain factor for the display appears in the **Gain** box.

The **Date** and **Time** boxes present the date and start time of the waveform displayed in the Ten Minute Display Panel.

The time span of the patient's waveform data as stored in the ***Menntor X7***'s memory appears in the bottom right-hand corner of the panel.

Statistical data for the ten seconds under review appear below the waveforms, including:

- RR intervals between beats in milliseconds
- Time stamps for the beginning, middle and end of the ten second period
- Location and classification of each QRS complex on the waveforms. "." indicates a normal QRS complex, "v" indicates a ventricular QRS complex, "p" indicates a pacemaker-induced ventricular QRS complex, "a" indicates a ventricular QRS complex that does not fit into any defined category and "l" indicates a QRS complex detected during the ECG waveform learning stage.
- List of alarms that were activated during the ten second period with a time stamp for each alarm

- ***To operate the Ten Second Display panel:***

1. To change the gain factor of the display, select a different factor from the **Gain** drop-down list. Available options are **1mv/cm** and **2mv/cm**.
2. To scroll forward ten seconds, press **Scroll Right**. Waveforms and statistical data specific to the new time period appear.
3. To scroll back ten seconds, press **Scroll Left**. Waveforms and statistical data specific to the new time period appear.
4. To view the waveforms and related statistical data for a specific ten second period, press **Go To** and enter the required date in the **Date** dialog panel and start time in the **Time** dialog panel. Make sure the required date and start and end times fall within the time span of stored data.
5. To exit the **Ten Second Display panel** and return to the **Ten Minute Display** panel, press **Zoom Out**.
   The following list of options will open:
   - Zoom out
   - Mark event
   - Print
   - Overview
   - Chart
   - Trend panel.

- Cancel

Select **Zoom out** to return to return to the **Ten Minute Display** panel.

6. Press **Print** to print the Ten Second page of the Full Disclosure
7. To exit the **Ten Second Display** panel and return to the main screen display, press **Main Screen**.

Overview Panel

The Overview panel enables you to review a patient's waveforms with associated data for at least 6 hours (5 days for extended memory), depending on the configuration of your system.

The Overview panel presents a snapshot of waveform activity for the top-most ECG lead and all other vital signs on the main screen display during a selected ten second time frame. It also presents the following data for the selected time frame:

*Scales for each vital sign, where applicable

*Numerical vital sign values

*List of alarms that were triggered during that time period, including the time the alarm started.

- ***To access the Overview panel:***

1. From the Main menu select the **Patient Data** key
   –or–
   If a **Patient Data** function key appears on the main screen, turn the QuicKnob™ until the **Patient Data** key is highlighted and press to access the **Data Review** menu.
2. From the **Patient Data** menu
   –or–
   When the **Patient Data** panel is already displayed, from the drop-down menu below the panel title, select **Overview** to open the **Overview** panel.

Figure 10-12: The Overview Panel

The waveform for each vital sign is displayed in the same color as the vital sign on the main screen display. A scale for each vital sign appears on the left side of the panel.

Calculated vital sign values appear above each waveform. For arterial and pulmonary artery blood pressure, three values appear: Systolic, diastolic and mean. Where applicable, the vital sign value current at the point where the cursor intersects the waveforms appears in parentheses.

The **Date** and **Time** boxes present the date and start time of the waveforms currently displayed.

The time span of the patient's waveform data stored in the ***Menntor X7***'s memory appears in the bottom right corner of the panel.

Statistical data for the ten seconds under review appear below the waveforms, including:

- Time stamps for the beginning, middle and end of the ten second period
- List of alarms during the ten second period with a time stamp for each alarm

- ***To operate the Overview panel:***

1. To change the cursor resolution, select a different resolution from the **Cursor** drop-down list. Available options are **1 sec**, **500 msec**, **250 msec**, **125 msec**, **62.5 msec** and **31.25 msec**.
2. To change the gain factor of the ECG display, select a different factor from the **Gain** drop-down list. Available options are **1mv/cm** and **2mv/cm**.
3. To scroll forward five seconds, press **Move Right**. Waveforms and data specific to the new time period appear.
4. To scroll back five seconds, press **Move Left**. Waveforms and data specific to the new time period appear.
5. To scroll continuously through the waveforms, press **Scroll** and use the QuicKnob™ to move the cursor forwards or backwards. Data related to the on-screen waveforms appear.
6. To view the waveforms and related statistical data for a specific ten second period, press **Go To** and enter the required date in the **Date** dialog panel and start time in the **Time** dialog panel. Make sure the required date and start and end times fall within the time span of stored data.
7. To print the **Overview** panel, press **Print Key** on the top of the panel.
8. From the **Patient Data** drop-down menu, select **Charts**, **Trends** or **Full Disclosure**. The **Overview** panel closes and the selected panel opens displaying data for the time frame displayed in the **Overview** panel.
9. Press **Main Screen** to close the panel and return to the main screen display.

Event Strips

Full Disclosure and Overview of all ECG and vital signs waveforms are stored in the memory of the ***Menntor X7*** patient monitor for at least 6 hours (5 days for extended memory). The user has the option of saving up to 75 important Event strips for the whole duration of patient monitoring until discharge.

The Event strips can also be transferred with other patient data to another monitor, when the patient is transferred from one monitored bed to another monitored bed.

Event Strips are automatically created upon Clinical Alarms and can also be created manually.

- ***To create an Event Strip:***

1. Enter the Full disclosure or Overview panel

2. Locate the event you wish to mark by selecting the following:
   "Zoom in" in 10 minutes Full disclosure
   "Zoom out" in 10 second Full Disclosure
3. A window with a list of options will open:
   Zoom out
   Mark Event
   Print, etc.
4. Select **Mark Event**
5. A list of predefined labels will open
6. Select a predefined label or Select **Edit manual** to open an alphanumeric panel and create a new label
7. An **Event Strip** of 20 Seconds of all waveforms is stored in the memory of the ***Menntor X7*** under the selected Event label

- ***To create Event strip labels:***

1. Select "System Setup"
2. Select "Set Event Labels" from the System setup menu
3. A panel will all the event labels will open with the following options:
   Insert, Edit or Delete labels.
4. Selecting "Insert" or "Edit" will open an Alphanumeric panel and enable you to write or edit a label.

- ***To view a marked event:***

1. From the Main menu select the Patient Data key.
2. Select "Event Strip" in "Patient data menu"
3. A panel opens with the list of saved Event strips

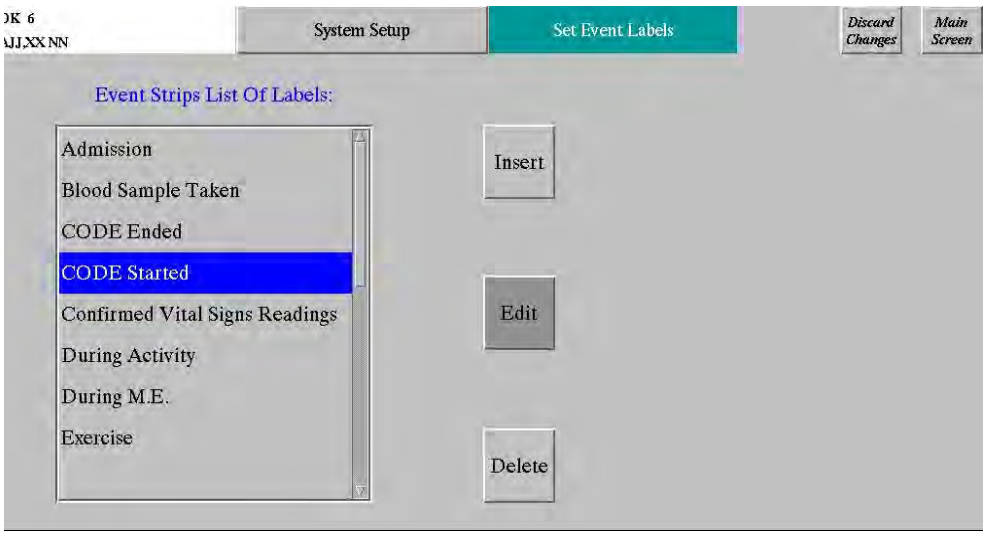


Figure 10-13: Panel of Event Strip List of Labels

Figure 10-14: Panel with List of Saved Event Strips

4. Select the required event - a window opens with the following options

Event Full Disc.

Event Overview

Edit Label

Delete

5. If you select **Event Full Disclosure** or **Overview**, a display panel showing 10 seconds of the event will be displayed.

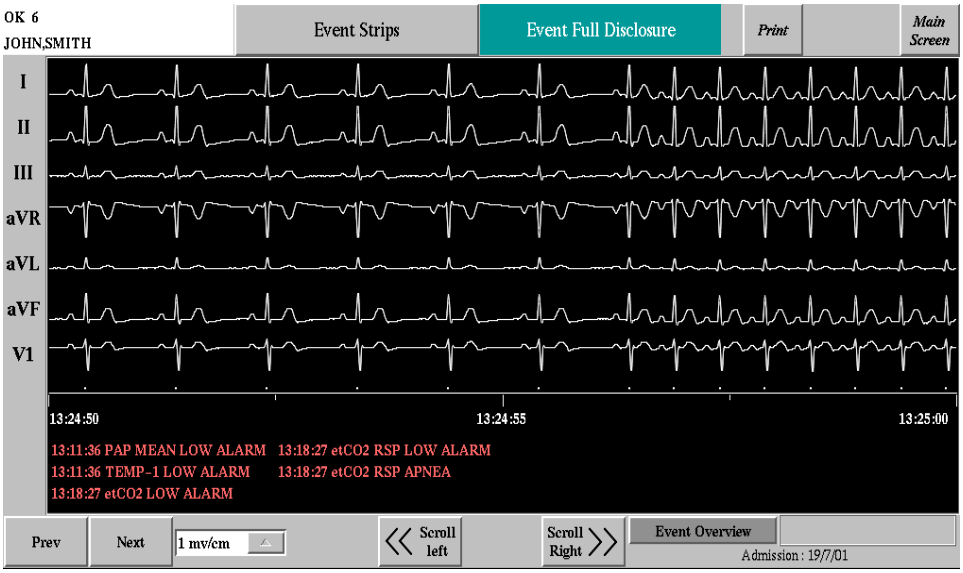


Figure 10-15: Event Full Disclosure

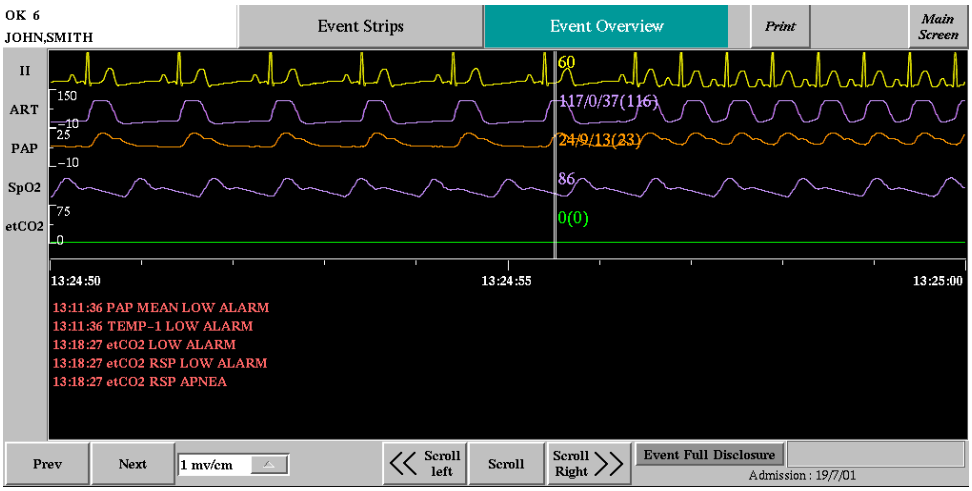


Figure 10-16: Event Overview

6. Use **Scroll Left or Right** to view event information for a period of 20 seconds
7. Use the **Prev./Next** keys at the low left side corner of the Event strip panel to view other Event strips
8. Use the key on low right side of the Event strip panel to toggle between Overview and ECG Full disclosure of the same event

Reports

The Mennen Medical monitors have a reporting tool within the monitor.

Two types of reports can be created:

- Chart
- Trend

Each report includes:

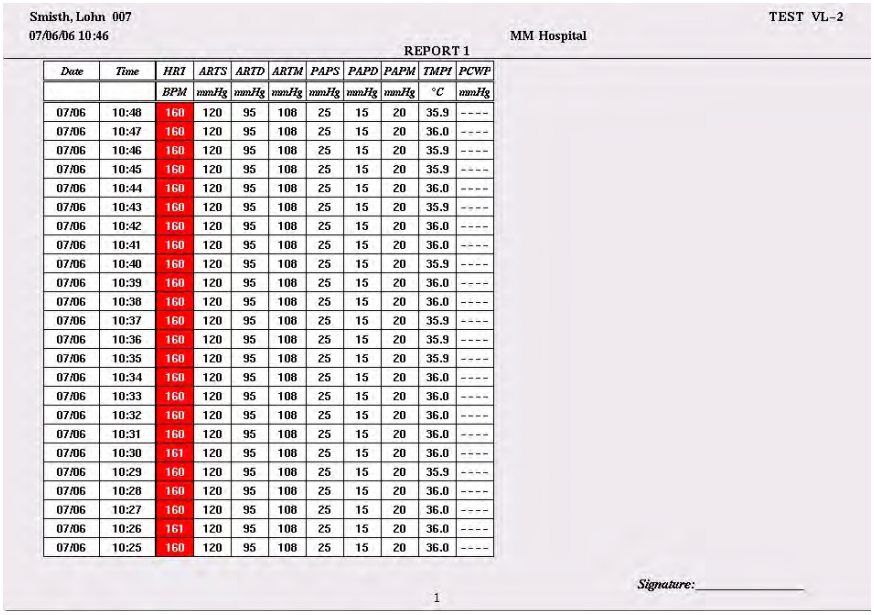
- Hospital Name (As set in the System Setup >> General setting)
- Patient name & ID
- Date and time
- Chart or Trend

Up to ten reports can be created in System Setup (see Appendix D , Chapter 5, Paragraph 5.12).

Chart Report

Any of the User define charts that are created in the monitor can be used for a Chart Report.

The user can set the chart filter to be used in the report, independently from the chart filter on the monitor.



Smisth, Lohn 007 — TEST VL-2
07/06/06 10:46 — MM Hospital
REPORT 1

Date	Time	HRI	ARTS	ARTD	ARTM	PAPS	PAPD	PAPM	TMPI	PCWP
		BPM	mmHg	mmHg	mmHg	mmHg	mmHg	mmHg	°C	mmHg
07/06	10:48	160	120	95	108	25	15	20	35.9	----
07/06	10:47	160	120	95	108	25	15	20	36.0	----
07/06	10:46	160	120	95	108	25	15	20	35.9	----
07/06	10:45	160	120	95	108	25	15	20	35.9	----
07/06	10:44	160	120	95	108	25	15	20	36.0	----
07/06	10:43	160	120	95	108	25	15	20	35.9	----
07/06	10:42	160	120	95	108	25	15	20	36.0	----
07/06	10:41	160	120	95	108	25	15	20	36.0	----
07/06	10:40	160	120	95	108	25	15	20	35.9	----
07/06	10:39	160	120	95	108	25	15	20	36.0	----
07/06	10:38	160	120	95	108	25	15	20	36.0	----
07/06	10:37	160	120	95	108	25	15	20	35.9	----
07/06	10:36	160	120	95	108	25	15	20	35.9	----
07/06	10:35	160	120	95	108	25	15	20	35.9	----
07/06	10:34	160	120	95	108	25	15	20	36.0	----
07/06	10:33	160	120	95	108	25	15	20	36.0	----
07/06	10:32	160	120	95	108	25	15	20	36.0	----
07/06	10:31	160	120	95	108	25	15	20	36.0	----
07/06	10:30	161	120	95	108	25	15	20	36.0	----
07/06	10:29	160	120	95	108	25	15	20	35.9	----
07/06	10:28	160	120	95	108	25	15	20	36.0	----
07/06	10:27	160	120	95	108	25	15	20	36.0	----
07/06	10:26	161	120	95	108	25	15	20	36.0	----
07/06	10:25	160	120	95	108	25	15	20	36.0	----

Signature:_____

1

Figure 10-17: Chart Report

Trend Report

Up to eight graphic trend parameters can be included in each Trend report.

Any of the vital signs can be shown in the trend graphs.

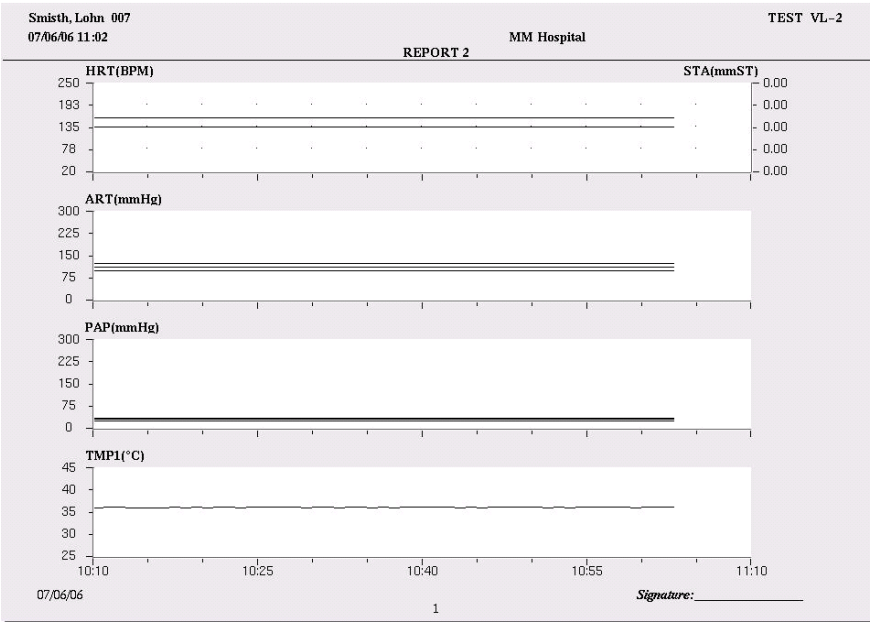


Figure 10-18: Trend Report

Printing a Report

The reports can be printed on a network laser printer.

The printing will occur either upon request, or automatically:

- At a pre-selected time of the day
- At the end of one of three shifts of the day. (for example : 07:00, 15:00, 23:00)
- Upon Discharge

Note: *Any report can be printed up to three times every day.*

The reports formats and durations are prepared in System Setup (password protected) - Report Setup (see Paragraph 5.12 in Appendix D).

To print / preview a report:

1. Press the **Patient Data** key (orange) to display the Patient Data menu.

   The **Report** panel appears

.

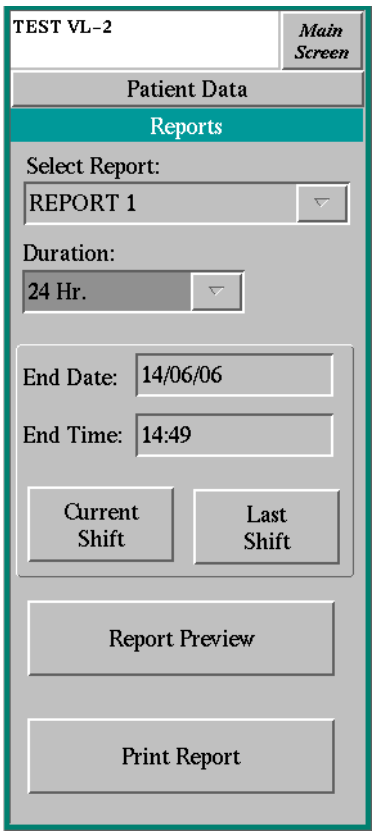


Figure 10-19: Report Panel

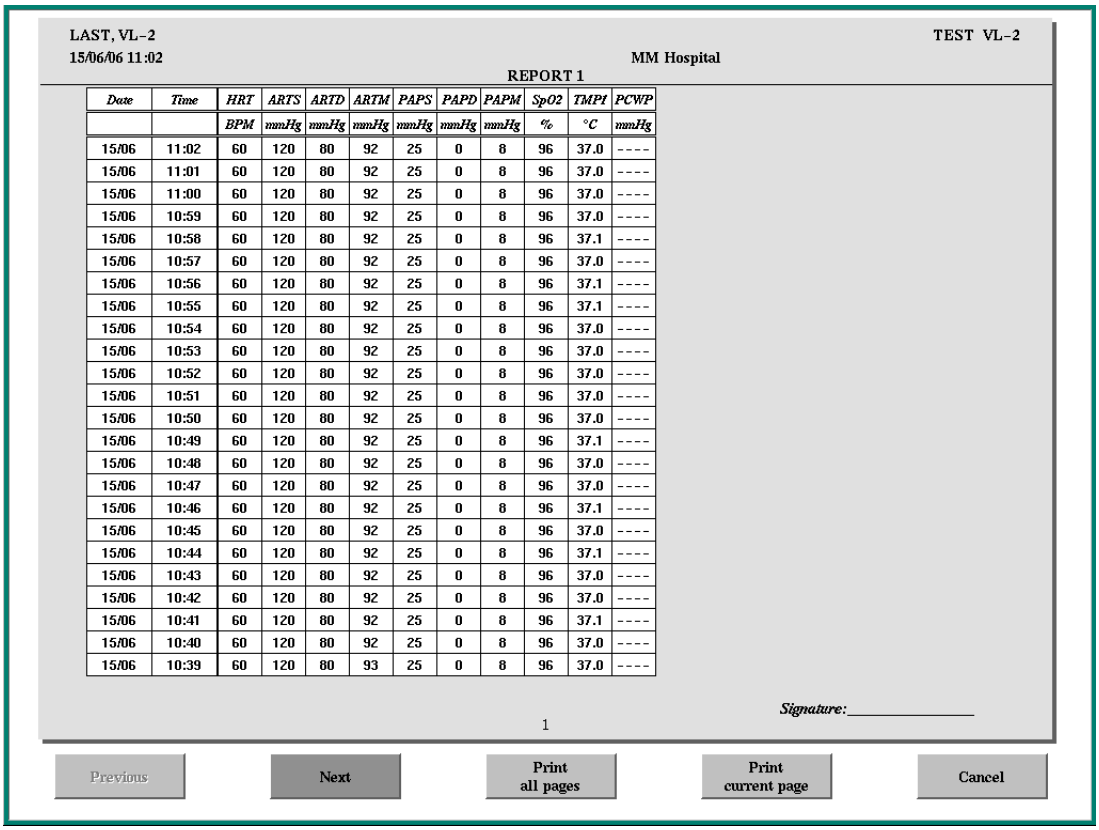
2. Select a **Report** name.
3. Select the report duration.

Note: *The total duration of the report is set in the System Setup - Report Setup,the duration box enables creating reports for a part of the original report duration.*

4. Select the end date and time for the report.

Note: *Pressing either **Current Shift**, or **Previous Shift** will set the end time of the report to the end of the selected shift.*

5. Click one of the following:
   - **Print Report** to print the report on the laser printer.
   - **Report Preview** to preview the report on screen



Date	Time	HRT	ARTS	ARTD	ARTM	PAPS	PAPD	PAPM	SpO2	TMPI	PCWP
		BPM	mmHg	mmHg	mmHg	mmHg	mmHg	mmHg	%	°C	mmHg
15/06	11:02	60	120	80	92	25	0	8	96	37.0	----
15/06	11:01	60	120	80	92	25	0	8	96	37.0	----
15/06	11:00	60	120	80	92	25	0	8	96	37.0	----
15/06	10:59	60	120	80	92	25	0	8	96	37.0	----
15/06	10:58	60	120	80	92	25	0	8	96	37.1	----
15/06	10:57	60	120	80	92	25	0	8	96	37.0	----
15/06	10:56	60	120	80	92	25	0	8	96	37.1	----
15/06	10:55	60	120	80	92	25	0	8	96	37.1	----
15/06	10:54	60	120	80	92	25	0	8	96	37.0	----
15/06	10:53	60	120	80	92	25	0	8	96	37.0	----
15/06	10:52	60	120	80	92	25	0	8	96	37.0	----
15/06	10:51	60	120	80	92	25	0	8	96	37.0	----
15/06	10:50	60	120	80	92	25	0	8	96	37.0	----
15/06	10:49	60	120	80	92	25	0	8	96	37.1	----
15/06	10:48	60	120	80	92	25	0	8	96	37.0	----
15/06	10:47	60	120	80	92	25	0	8	96	37.0	----
15/06	10:46	60	120	80	92	25	0	8	96	37.1	----
15/06	10:45	60	120	80	92	25	0	8	96	37.0	----
15/06	10:44	60	120	80	92	25	0	8	96	37.1	----
15/06	10:43	60	120	80	92	25	0	8	96	37.0	----
15/06	10:42	60	120	80	92	25	0	8	96	37.0	----
15/06	10:41	60	120	80	92	25	0	8	96	37.1	----
15/06	10:40	60	120	80	92	25	0	8	96	37.0	----
15/06	10:39	60	120	80	93	25	0	8	96	37.0	----

Figure 10-20: Preview Screen

The Preview screen includes Patient name and ID, Date & Time of the Report, Hospital Name, Unit and Bed number and the buttons listed in the following table.

Table 10-2: Preview Screen Buttons

Button	Function
Previous	Preview the previous report page
Next	Preview the next report page
Print all Pages	Print all report pages on a laser printer
Print Current Page	Print the currently displayed report page on a laser printer
Cancel	Exit the Report preview

Heart Rate Variability - HRV

Introduction

Heart Rate Variability of the normal ECG contractions (non ventricular QRS) is assumed to provide information on the parasympathetic activity and to have some predictive value for the fate of cardiac patients.

There are three ways to review HRV:

- Time Domain,
- Frequency Domain
- Histogram.

Mennen monitors provide HRV in Time Domain and as a Histogram.

In the Time Domain, HRV is performed in 5 minute epochs (time periods).

Features

HRV includes the following:

- Histogram of normal QRS complexes, R-R intervals, for a user selected time interval.
- Chart of Time domain HRV calculated parameters (see Table 10-3).
- Graphic trend of Time domain of HRV calculated parameters.

HRV – Time Domain

➤ ***To operate the HRV Time Domain***

1. To display the Interval histogram use **HRV histogram** key in **Patient Data** menu.
2. In **System Setup** >**Tabular chart** (see “Tabular Charts” on page 7-69) prepare a chart that includes the HRV parameters. The minimal time interval is 5 minutes.
3. In Trend the HRV parameters are available for graphic display with a 5 minute resolution (see “Trends Setup” on page 7-67).

Table 10-3: HRV Parameters

Abbreviation	*Definition*
ANN	Mean RR interval of normal beats
SDNN	Standard Deviation of RR intervals of normal beats

Table 10-3: HRV Parameters

Abbreviation	*Definition*
RMSSD	Root Mean Square (RMS) of differences of successive intervals of normal beats
NN50	Number of interval differences between successive beats that are above 50 mSec.
PNN50	Percentage of successive intervals with more than 50 mSec difference

Note: *References*
1.Guidelines - Heart Rate Variability Standard of Measurement European Heart Journal (1996) 17 , 354 - 381 .

Time Domain Numeric Chart

Note: *The chart was created using a simulator with Atrial Fibrillation*

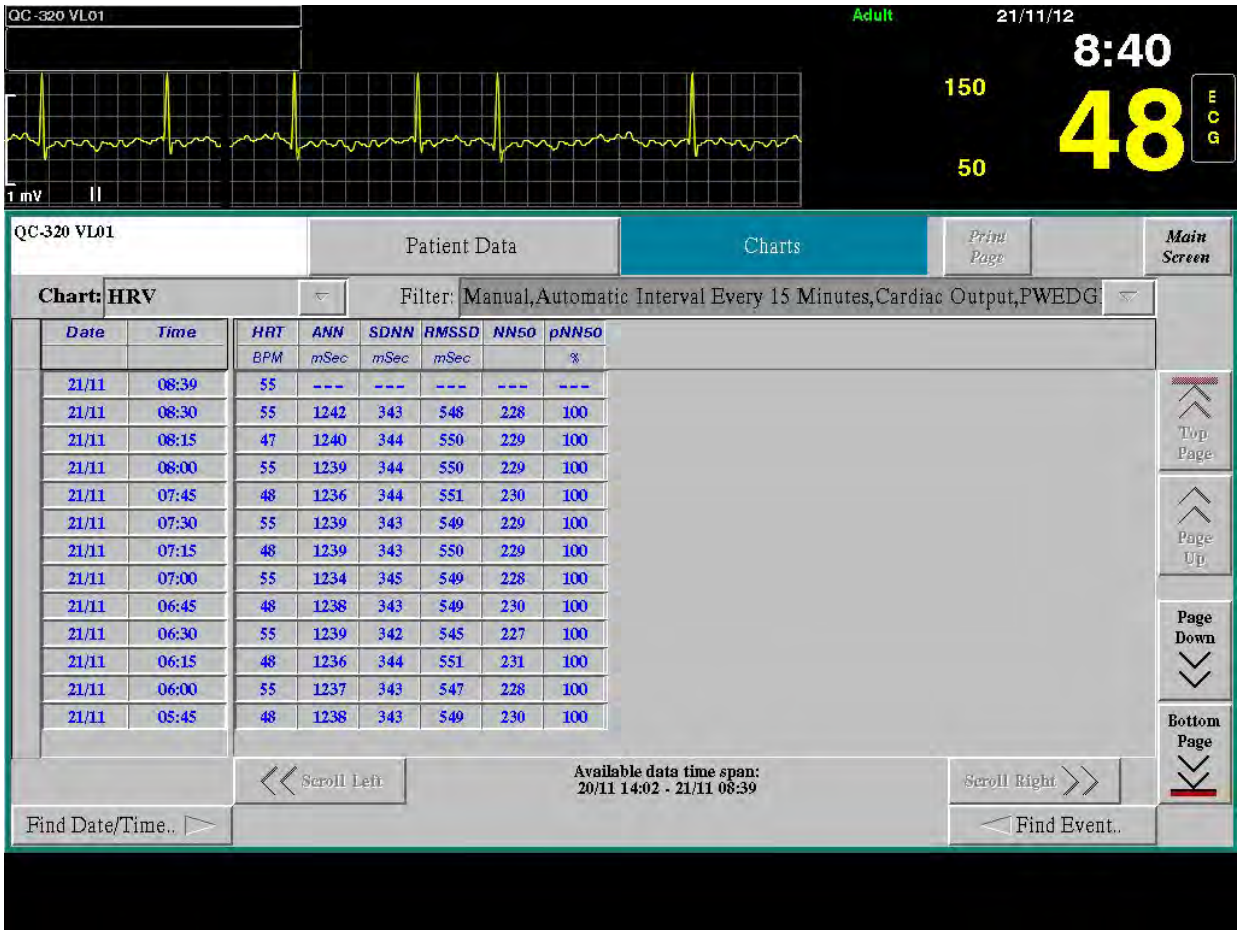


Figure 10-21: Time Domain Numeric Chart

Time Domain Graphic Trend

Note that the graphic trend shows points every 5 minutes since this is the epoch of the time domain statistics.

Figure 10-22: Time Domain Graphic Trend

HRV Histogram

Collects NNi interval for a user-defined interval (Minimal interval is 5 minutes) into bins in stages of 20mSec = 1/50 Sec .

The Histogram is shown graphically by vertical bars representing the percentage of beats within each interval bin.

A cursor is provided showing the percentage of beats at the cursor position.

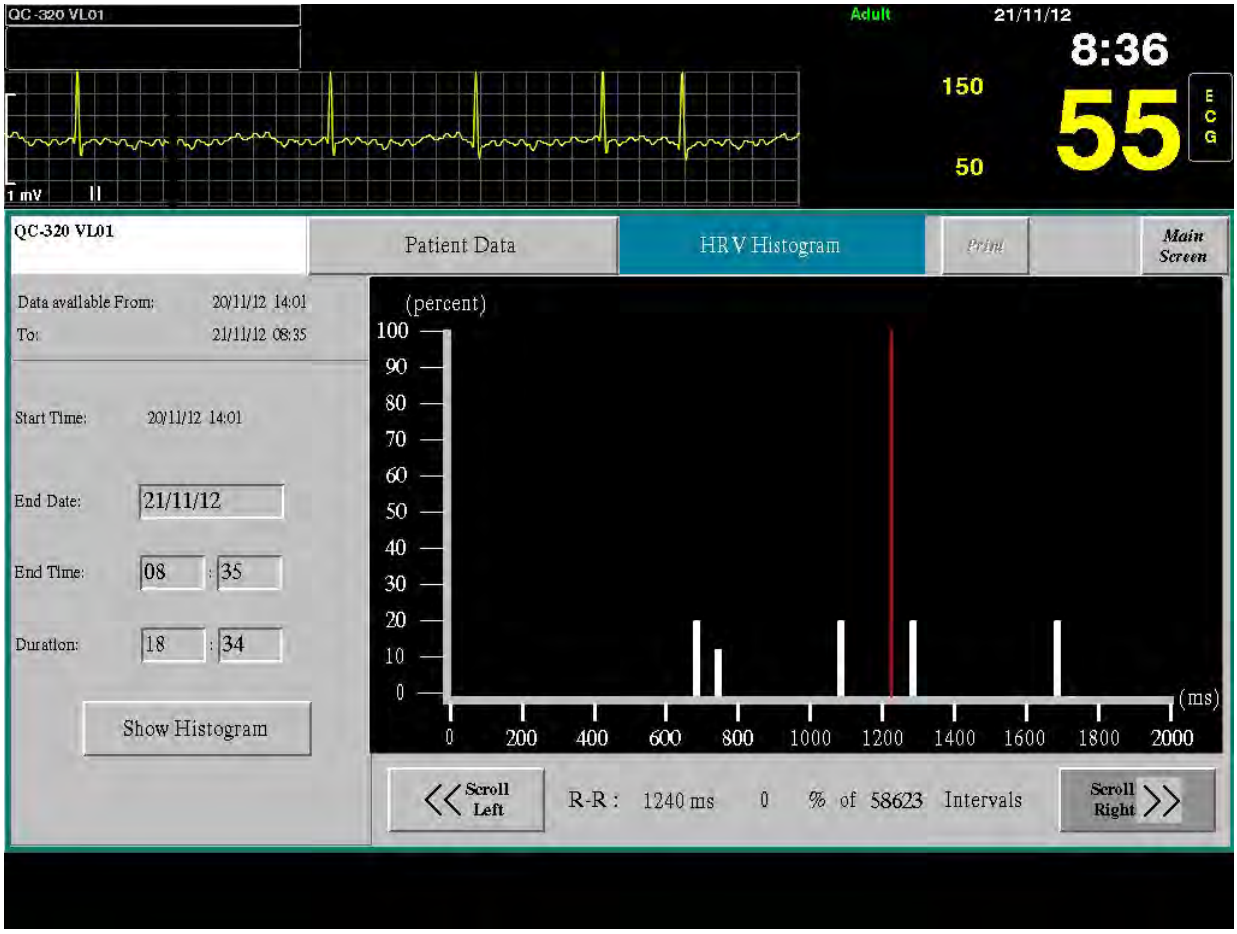


Figure 10-23: HRV Histogram

➤ ***To activate HRV Histogram:***

1. From the Main menu select the **Patient Data** key to access the **Patient Data** menu.

2. In the Patient Data menu click **HRV Histogram**.

3. Set end date and time.
4. Select duration.
5. Click **Show Histogram**.

Note: *Minimal Histogram time is 5 minutes*

CHAPTER 11: PERFORMING CLINICAL CALCULATIONS

The ***Menntor X7*** Clinical Calculation package supports a set of physiological calculation functions that allow you to calculate a set of predefined physiological parameters, based on monitored clinical data.

The following physiological calculation functions are available:

- Hemodynamics
- Respiratory Mechanics
- Oxygenation
- Renal Clearance

Each physiological calculation panel includes fields that display monitored data. Since part of the data required for calculations is not monitored by the ***Menntor X7***, you need to manually enter it into the calculation panel in the appropriate fields. You can also edit or update monitored data, if necessary.

Once you edit monitored data and manually enter missing data, the ***Menntor X7*** automatically recalculates all the derived parameters pertaining to the specific set of physiological functions.

After viewing the calculated results, you can store them for future use in the appropriate chart.

Viewing the Calculation Panels

The physiological calculation panels consist of two types of values:

- **Measured values** - data automatically monitored by the ***Menntor X7*** or manually entered data
- **Calculated values** - data derived and calculated by the ***Menntor X7*** based on the measured values

➤ ***To access the Calculation panels:***

1. On the ***Menntor X7*** Main menu, press the **Patient Data** key.
2. In the **Data Review** menu, select **Calculations**.
3. In the **Calculations** menu, select the required physiological panel:
   - Hemodynamics
   - Respiratory Mechanics
   - Oxygenation
   - Renal Clearance

   The required panel opens, displaying the patient's monitored data.

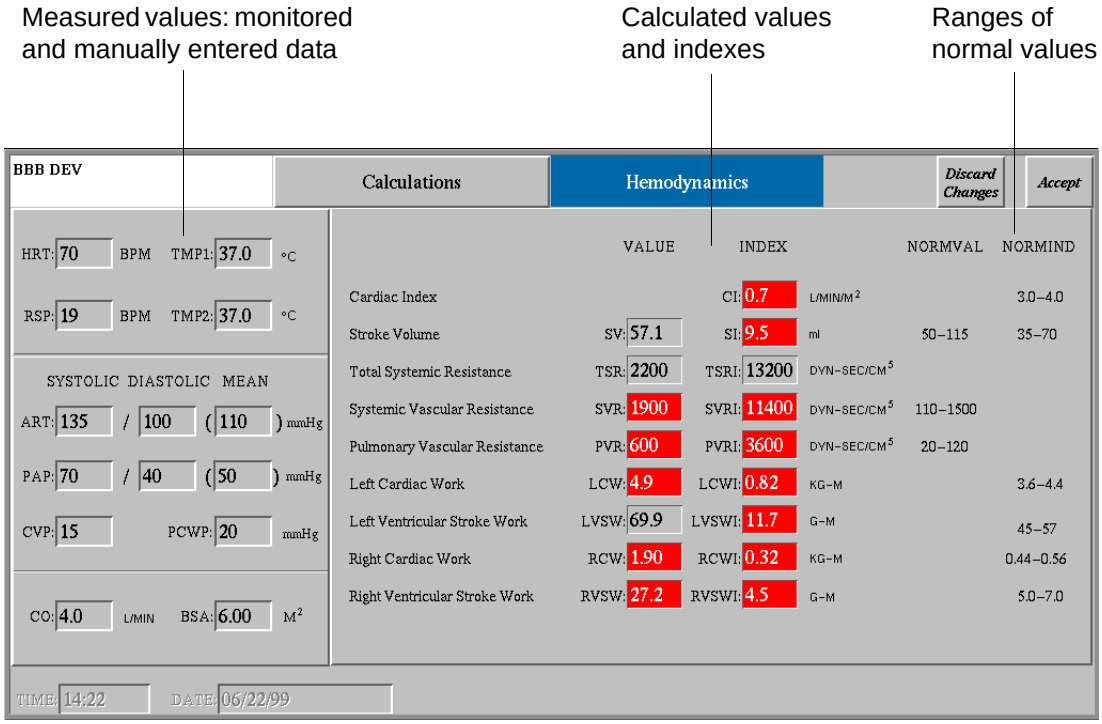

Measured values: monitored and manually entered data
Calculated values and indexes
Ranges of normal values
BBB DEV
Calculations
Hemodynamics
Discard Changes
Accept
HRT: 70 BPM
TMP1: 37.0 °C
RSP: 19 BPM
TMP2: 37.0 °C
SYSTOLIC DIASTOLIC MEAN
ART: 135 / 100 (110) mmHg
PAP: 70 / 40 (50) mmHg
CVP: 15
PCWP: 20 mmHg
CO: 4.0 L/MIN
BSA: 6.00 M²
TIME: 14:22
DATE: 06/22/99
VALUE
INDEX
NORMVAL
NORMIND
Cardiac Index CI: 0.7 L/MIN/M² 3.0–4.0
Stroke Volume SV: 57.1 SI: 9.5 ml 50–115 35–70
Total Systemic Resistance TSR: 2200 TSRI: 13200 DYN-SEC/CM⁵
Systemic Vascular Resistance SVR: 1900 SVRI: 11400 DYN-SEC/CM⁵ 110–1500
Pulmonary Vascular Resistance PVR: 600 PVRI: 3600 DYN-SEC/CM⁵ 20–120
Left Cardiac Work LCW: 4.9 LCWI: 0.82 KG-M 3.6–4.4
Left Ventricular Stroke Work LVSW: 69.9 LVSWI: 11.7 G-M 45–57
Right Cardiac Work RCW: 1.90 RCWI: 0.32 KG-M 0.44–0.56
Right Ventricular Stroke Work RVSW: 27.2 RVSWI: 4.5 G-M 5.0–7.0

Figure 11-1: Example of a Physiological Calculation Panel

The left side of the panel displays the **Measured values**, monitored by the ***Menntor X7***. Here you can manually enter any missing data, or edit and update existing values. Once you enter or edit data, the right side of the panel displays the **Calculated values**. The Hemodynamics, Oxygenation and Renal Clearance calculation panels also display **Indexes**. Indexes are values calculated per unit of body surface (BSA).

For comparison, a range of normal values (NORMVAL) and normal indexes (NORMIND) is presented. Values that are not within the normal range appear on a red background.

Upon changing a measured field, all the calculated fields are automatically recalculated and updated.

The following buttons and functions appear in each of the charts:

- Discard Changes - exits the main screen display without saving changes
- Accept - saves calculations in the appropriate chart and exits the screen

Hemodynamics Calculations

In the Hemodynamics panel you can view monitored hemodynamic data and perform clinical calculations.

➤ ***To perform Hemodynamics calculations:***

1. On the ***Menntor X7*** Main menu, press the **Patient Data** key.
2. In the **Patient Data** menu, select **Calculations**.
3. In the **Calculations** menu, select **Hemodynamics**.

   The **Hemodynamics** panel opens, displaying the patient's monitored data.

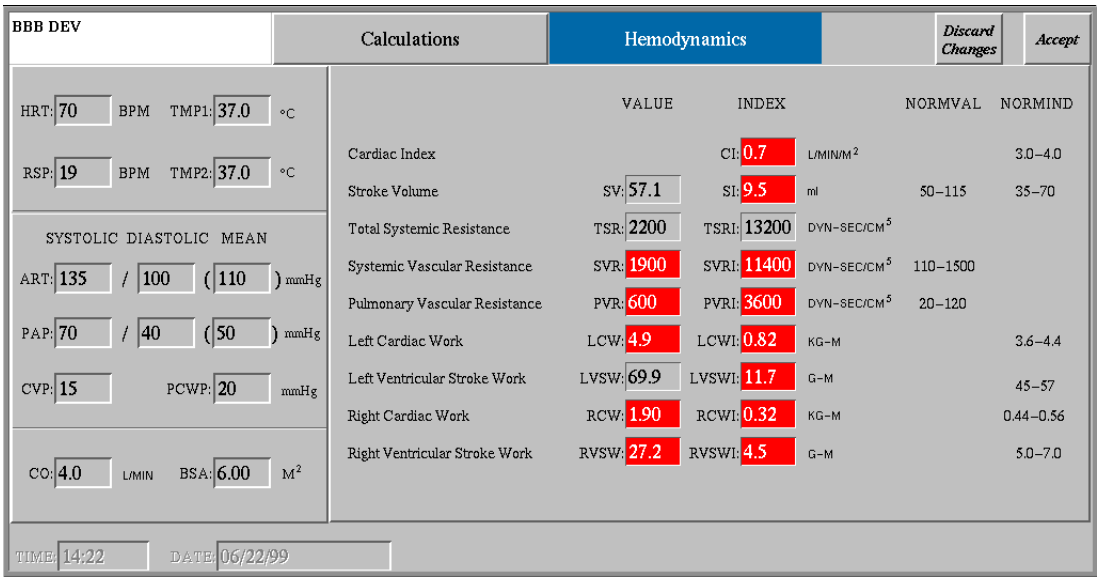

BBB DEV
Calculations
Hemodynamics
Discard Changes
Accept
HRT: 70 BPM TMP1: 37.0 °C
RSP: 19 BPM TMP2: 37.0 °C
SYSTOLIC DIASTOLIC MEAN
ART: 135 / 100 (110) mmHg
PAP: 70 / 40 (50) mmHg
CVP: 15 PCWP: 20 mmHg
CO: 4.0 L/MIN BSA: 6.00 M²
TIME: 14:22 DATE: 06/22/99
VALUE INDEX NORMVAL NORMIND
Cardiac Index CI: 0.7 L/MIN/M² 3.0–4.0
Stroke Volume SV: 57.1 SI: 9.5 ml 50–115 35–70
Total Systemic Resistance TSR: 2200 TSRI: 13200 DYN-SEC/CM⁵
Systemic Vascular Resistance SVR: 1900 SVRI: 11400 DYN-SEC/CM⁵ 110–1500
Pulmonary Vascular Resistance PVR: 600 PVRI: 3600 DYN-SEC/CM⁵ 20–120
Left Cardiac Work LCW: 4.9 LCWI: 0.82 KG-M 3.6–4.4
Left Ventricular Stroke Work LVSW: 69.9 LVSWI: 11.7 G-M 45–57
Right Cardiac Work RCW: 1.90 RCWI: 0.32 KG-M 0.44–0.56
Right Ventricular Stroke Work RVSW: 27.2 RVSWI: 4.5 G-M 5.0–7.0

Figure 11-2: Hemodynamics Panel

4. Manually enter all missing data, and update any existing values, if necessary.

Calculated values and indexes appear on the right side of the panel. Out of range values appear on a red background.

5. Click the **Accept** button to save calculations and exit the screen.

   The results of the measurement and calculations are saved in the Hemodynamics chart. You can access the results from the **Charts** option in the **Data Review** menu.

Respiratory Mechanics Calculations

In the Respiratory Mechanics panel you can view monitored respiratory data, and perform clinical calculations.

➤ ***To perform Respiratory calculations:***

1. On the ***Menntor X7*** Main menu, press the **Patient Data** key.
2. In the **Patient Data** menu, select **Calculations**.
3. In the **Calculations** menu, select **Respiratory Mechanics**.

   The **Respiratory Mechanics** panel opens, displaying the patient's monitored data.

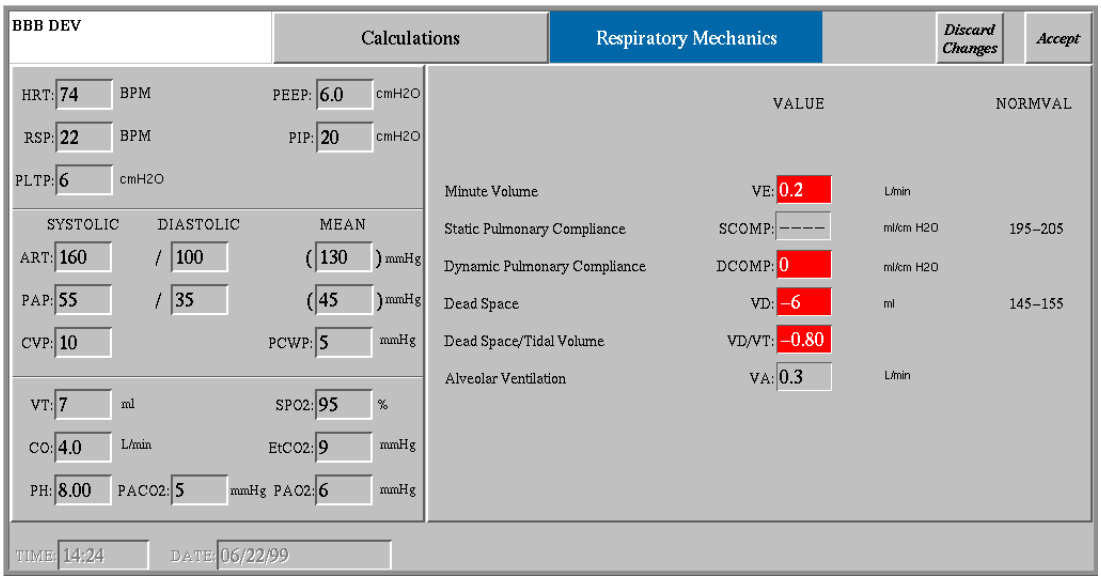


Figure 11-3: Respiratory Mechanics Panel

4. Manually enter all missing data, and update any existing values, if necessary.

   Calculated values appear on the right side of the panel. Out of range values appear on a red background.

5. Click the **Accept** button to save calculations and exit the screen.

   The results of the measurement and calculations are saved in the Respiratory Mechanics chart. You can access the results from the **Charts** option in the **Patient Data** menu.

Oxygenation Calculations

In the Oxygenation panel you can view monitored oxygenation data, and perform clinical calculations.

➤ ***To perform Oxygenation calculations:***

1. On the ***Menntor X7*** Main menu, press the **Patient Data** key.
2. In the **Patient Data** menu, select **Calculations**.
3. In the **Calculations** menu, select **Oxygenation**.

   The **Oxygenation** panel opens, displaying the patient's monitored data.

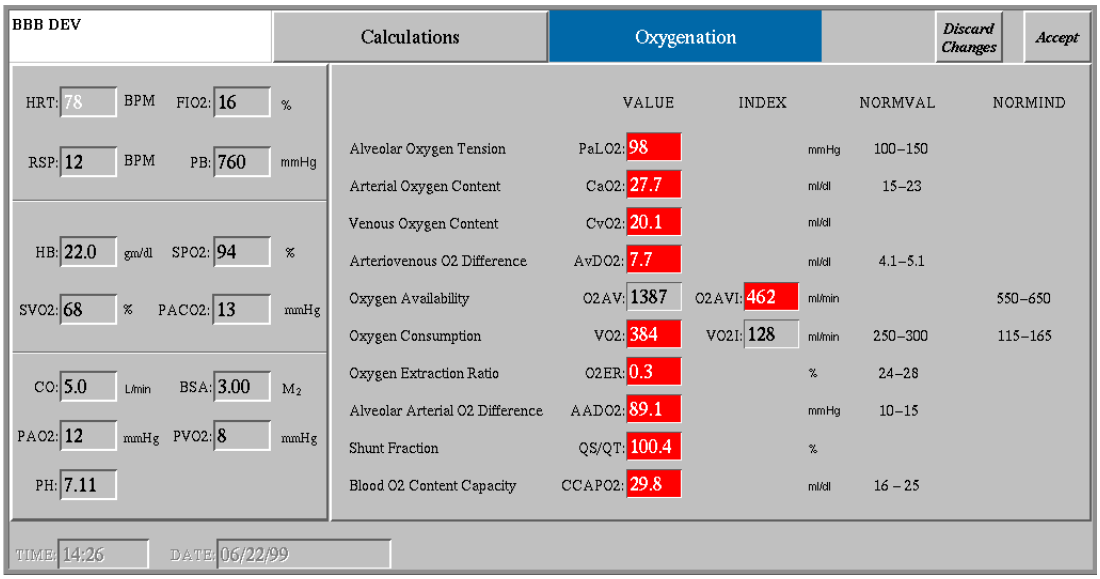


Figure 11-4: Oxygenation Panel

4. Manually enter all missing data, and update any existing values, if necessary.

   Calculated values and indexes appear on the right side of the panel. Out of range values appear on a red background.

5. Click the **Accept** button to save calculations and exit the screen.

   The results of the measurement and calculations are saved in the Oxygenation chart. You can access the results from the **Charts** option in the **Data Review**

menu.

Renal Clearance Calculations

In the Renal Clearance panel you can view monitored Renal data, and perform clinical calculations.

➤ ***To perform Renal calculations:***

1. On the ***Menntor X7*** Main menu, press the **Patient Data** key.
2. In the **Patient Data** menu, select **Calculations**.
3. In the **Calculations** menu, select **Renal Clarence**.

   The **Renal Clearance** panel opens, displaying the patient's monitored data.

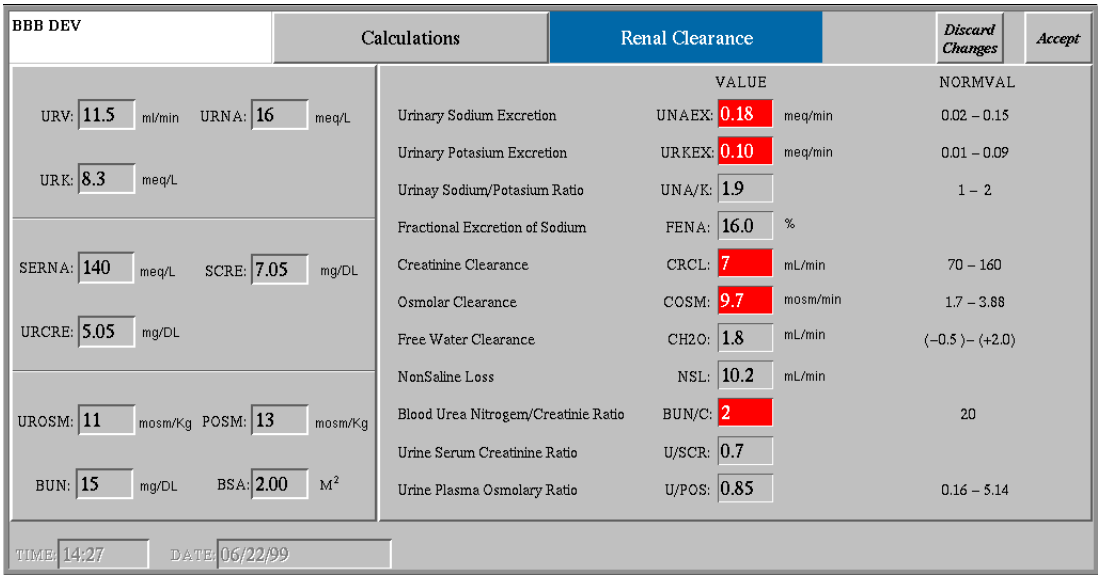

BBB DEV
Calculations
Renal Clearance
Discard Changes
Accept
URV: 11.5 ml/min
URNA: 16 meq/L
URK: 8.3 meq/L
SERNA: 140 meq/L
SCRE: 7.05 mg/DL
URCRE: 5.05 mg/DL
UROSM: 11 mosm/Kg
POSM: 13 mosm/Kg
BUN: 15 mg/DL
BSA: 2.00 M²
TIME: 14:27
DATE: 06/22/99
VALUE
NORMVAL
Urinary Sodium Excretion UNAEX: 0.18 meq/min 0.02 – 0.15
Urinary Potasium Excretion URKEX: 0.10 meq/min 0.01 – 0.09
Urinay Sodium/Potasium Ratio UNA/K: 1.9 1 – 2
Fractional Excretion of Sodium FENA: 16.0 %
Creatinine Clearance CRCL: 7 mL/min 70 – 160
Osmolar Clearance COSM: 9.7 mosm/min 1.7 – 3.88
Free Water Clearance CH2O: 1.8 mL/min (–0.5)– (+2.0)
NonSaline Loss NSL: 10.2 mL/min
Blood Urea Nitrogem/Creatinie Ratio BUN/C: 2 20
Urine Serum Creatinine Ratio U/SCR: 0.7
Urine Plasma Osmolary Ratio U/POS: 0.85 0.16 – 5.14

Figure 11-5: Renal Clearance Panel

4. Manually enter all missing data, and update any existing values, if necessary.

   Calculated values and indexes appear on the right side of the panel. Out of range values appear on a red background.

5. Click the **Accept** button to save calculations and exit the screen.

   The results of the measurement and calculations are saved in the Renal Clarence chart. You can access the results from the **Charts** option in the **Patient Data** menu.

CHAPTER 12: PERFORMING MEDICATION CALCULATIONS

The Menntor X7 Drug Calculation package allows fast and accurate calculation of drug infusion rates, drug concentrate and injection amounts, based on various clinically specified parameters.

The Calculation package comes with a default list of drugs supplied by Mennen Medical.

Calculation Formulas

Calculating the Infusion Rate

The rate of fluid administration for an IV is calculated based on patient weight, required medication dose rate, drug amount and total fluid volume in the IV bag.

Formula 1

If dose rate is given in units of mg / Kg / min

- **Total Dose Rate [gram/hour]**

  = (Dose Rate [mg / Kg / minute] x Patient Weight / 1000) x 60

- **Concentration of infusion fluid [gram/CC] =**

  = Drug amount added to IV [grams] / IV Fluid volume [CC]

- **Infusion Rate [CC/Hour]**

  = Total Dose Rate [gram/hour] / Concentration of infusion fluid [gram/CC]

Formula 2

If dose rate is given in units of gram / time

- **Total Dose Rate [gram/hour]**

  = Dose Rate [mg / minute] x / 1000 x 60

- **Concentration of infusion fluid [gram/CC] =**

  = Drug amount added to IV [grams] / IV Fluid volume [CC]

- **Infusion Rate [CC/hour] =**

  = Total Dose Rate [gram/hour] / Concentration of infusion fluid [gram/CC]

Calculating the Drug Concentration

The amount of medication to be added to the IV bag is calculated based on patient weight, dose rate, fluid infusion rate, and total fluid volume in the IV bag.

Formula 1

If dose rate is given in units of mg / Kg / min:

- **Total Dose Rate [gram/hour]**

  = (Dose Rate [gram / Kg / minute] x Patient Weight) x 60

- **Required Concentration [gram/CC] =**

  = Total Dose Rate [Gram/hour] / Infusion rate [CC/Hour]

- **Amount of Medication [gram]**

  = Required Concentration [Gram/CC] x Fluid Volume [CC]

Formula 2

If dose rate is given in units of gram / time:

- **Total Dose Rate [gram/hour]**

= Dose Rate [mg / minute] x / 1000 x 60

- **Required Concentration [Gram/CC] =**

= Total Dose Rate [Gram/hour] / Infusion rate [CC/hour]

- **Amount of Medication [Gram]**

= Required Concentration [gram/CC] x Fluid Volume [CC]

Calculating the Injection Amount

The amount of prepackaged drug that should be injected in order to achieve the desired dose can be calculated based upon the drug concentration or amount and the desired dose.

- **Intect Volume [CC] =**

  = Desired Drug dose [mg] / Package Drug concentration [mg/CC]

Accessing Medications

➤ ***To access Medication Calculation functions:***

1. On the Menntor X7 Main menu, press the **Patient Data** key.
2. In the **Patient Data** menu, select **Calculations**.
3. In the **Calculations** menu, select **Medications**. The **Medication** panel appears displaying a list of drugs.

   The QuicKnob™ may now be used to select the medication to be acted upon.

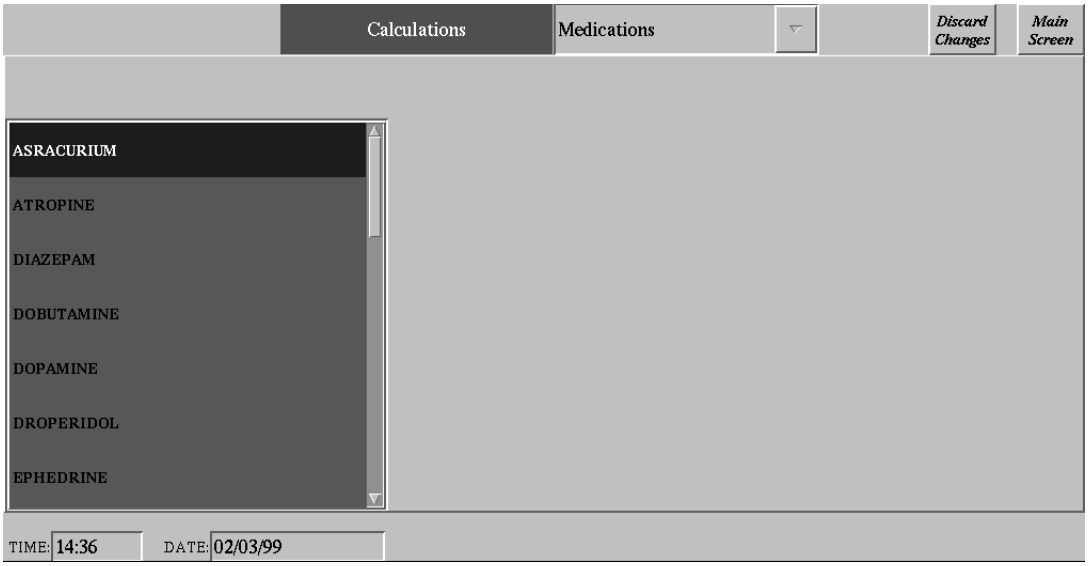


Figure 12-1: Medication List

➤ ***To select a medication:***

- Turn the QuicKnob™ clockwise or counterclockwise until you reach the required drug. The drug is now highlighted. Press in the QuicKnob™ to select the drug.

  A window appears for the drug allowing a choice of function to be performed: Infusion Rate calculation, Drug Concentrate calculation, Injection Amount calculation or the selection of another drug. These functions are detailed in the following sections.

Using The Medication Calculation Panels

For each calculation, whether infusion rate, drug concentrate or injection amount calculation, the Menntor X7 requests that you enter specific parameters relevant for the calculation. For example, patient weight, desired dose rate, etc.

➤ ***To enter the required parameters:***

1. In the Medication calculation panel, turn the QuicKnob™ until you reach the required parameter. The area is highlighted. Press the QuicKnob™ to select the area.
2. Turn the QuicKnob™ to set the required value/unit of measurement, and press again to accept the entry and advance to the next parameter.

   Upon entering all parameters, you can execute the calculation operation.

The following buttons and functions appear in each of the Medication calculation panels:

- Calculate - Executes calculations and displays results according to the selected function
- Drug List - Selects a medication from the list
- Dosage units - Converts current units to the selected units
- Discard Changes - Exits the main screen display without saving selections
- Main Screen - Exits the panel to the Main Display

Infusion Rate Calculation

The rate of administration for an IV is calculated based on patient weight, dose rate, desired drug amount and total fluid volume in the IV bag.

➤ ***To calculate the Infusion Rate:***

1. In the Medication list, select a drug.
2. In the **Function** list, select **Infusion Rate**. The **Infusion Rate** panel is displayed.

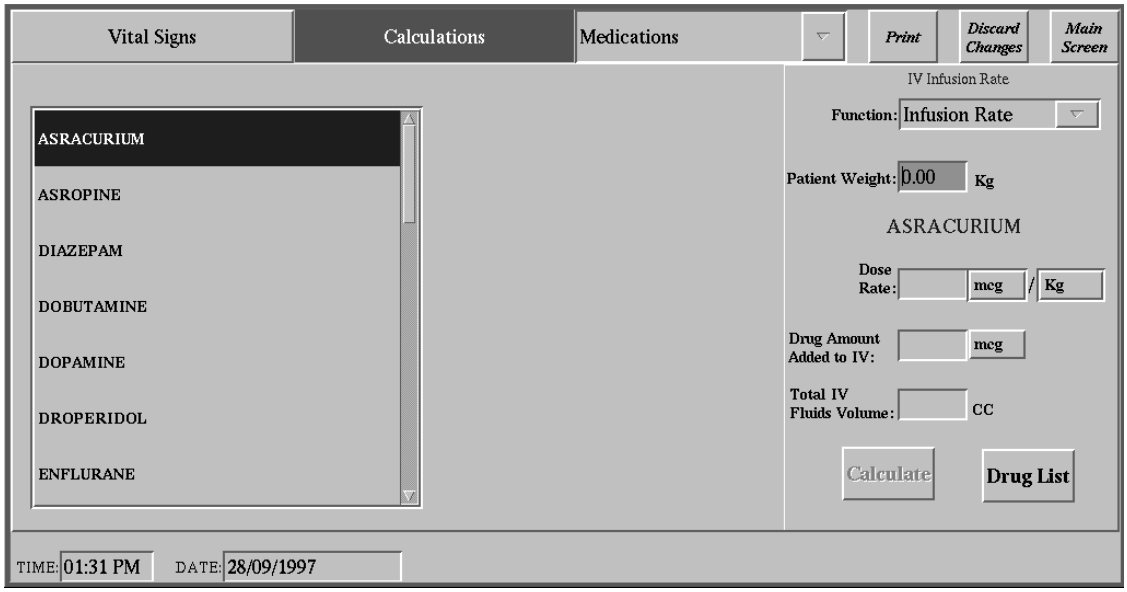


Figure 12-2: Infusion Rate Data Entry

The display requests information regarding the drug concentration in the IV bag, prescribed dose rate and patient weight.

3. Enter all requested information.
4. Press **Calculate**. The Infusion Rate calculation is performed.

   A titration chart of fifty infusion rate vs. dose rate sets is presented. The calculated infusion rate, corresponding to the selected dose rate, is highlighted.

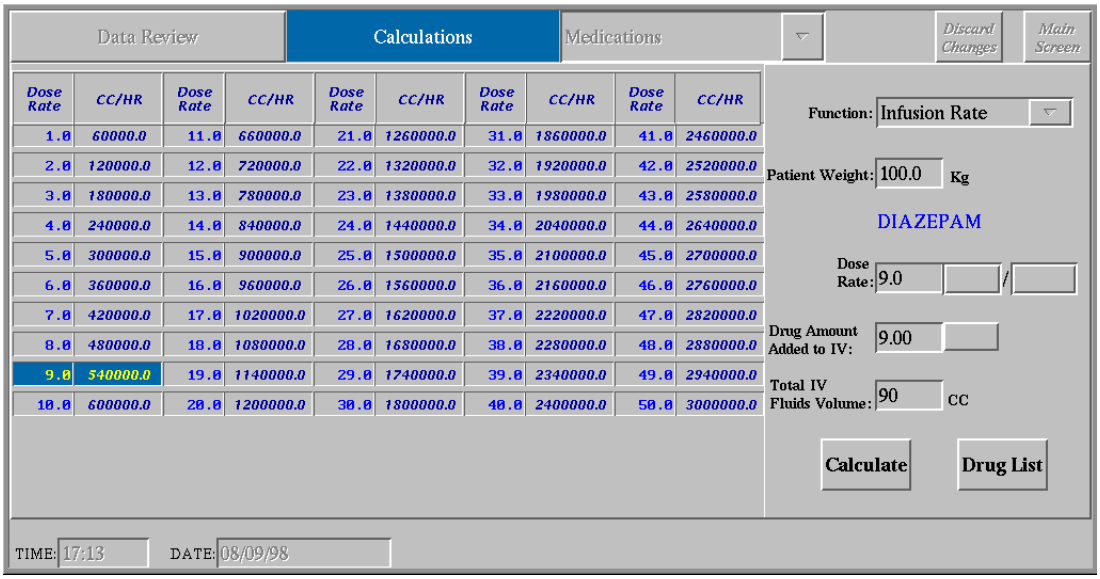


Figure 12-3: IV Infusion Rate Display

Note: *These results are not charted in the Medications Review Chart.*

Drug Concentrate Calculation

The amount of medication to be added to the IV is calculated based on patient weight, dose rate, fluid infusion rate, and total fluid volume in the IV bag.

➤ ***To calculate the drug amount:***

1. In the Medication list, select a drug.
2. In the **Function** list, select **Drug Concentrate**. The **Drug Concentrate** panel is displayed.

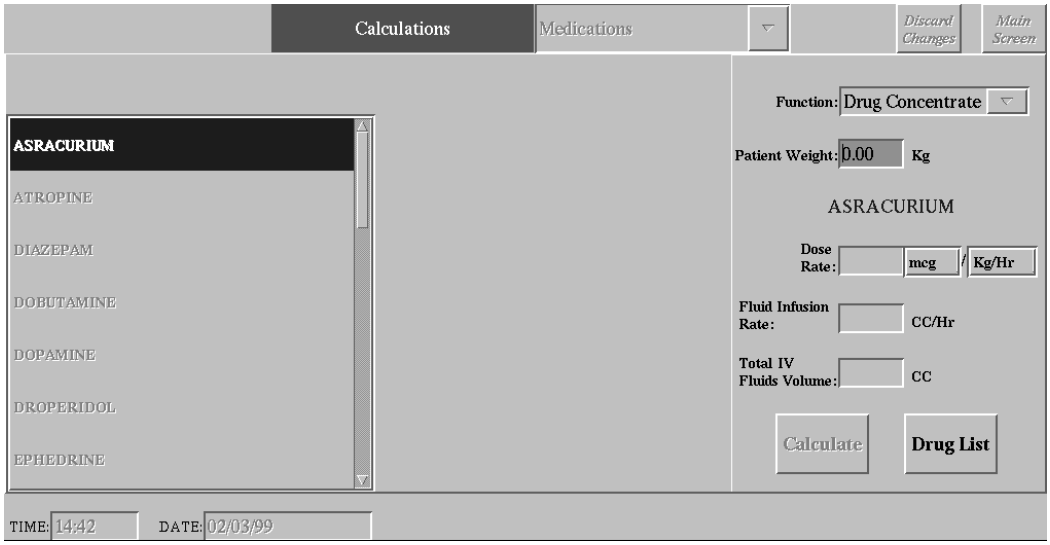


Figure 12-4: Drug Concentrate Data Entry

The display requests information regarding the infusion rate, prescribed dose rate and patient weight.

3. Enter all requested information.
4. Press **Calculate**. The drug amount that needs to be added to the IV in order to achieve the required dose rate is calculated.

   A titration chart of fifty drug amounts vs. dose rate sets is presented. The calculated drug amount, corresponding to the input data, is highlighted.

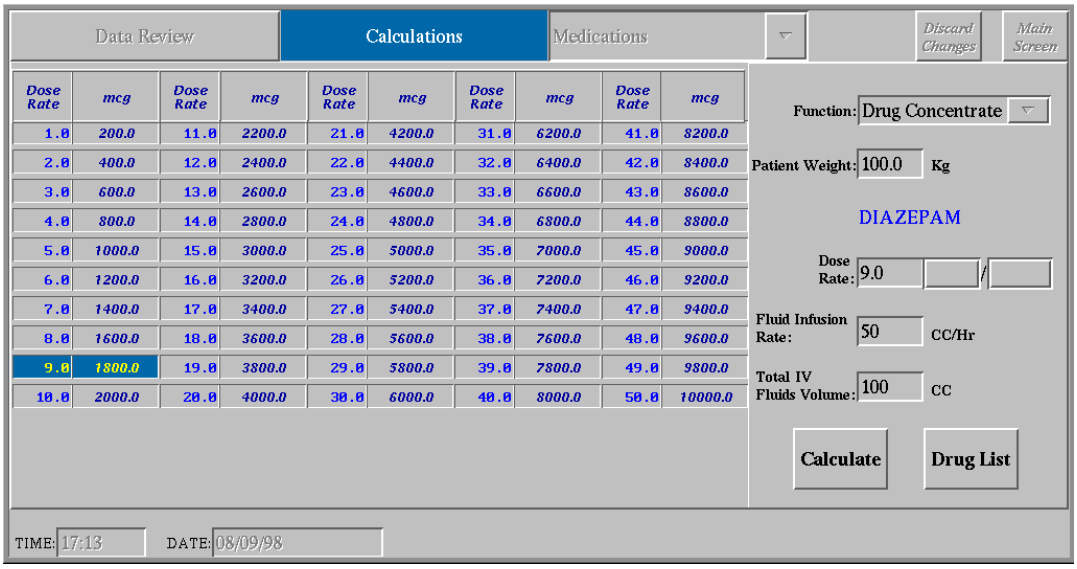


Figure 12-5: Drug Concentrate Display

Note: *These results are not charted in the Medications Review Chart.*

Injection Amount Calculation

The amount of prepackaged drug to be injected to achieve a desired dose can be calculated based upon the drug concentration or amount and the desired dose.

➤ ***To calculate the injection amount:***

1. In the Medication list, select a drug.
2. In the **Function** list, select **Injection Amount**. The **Injection Amount** panel is displayed.

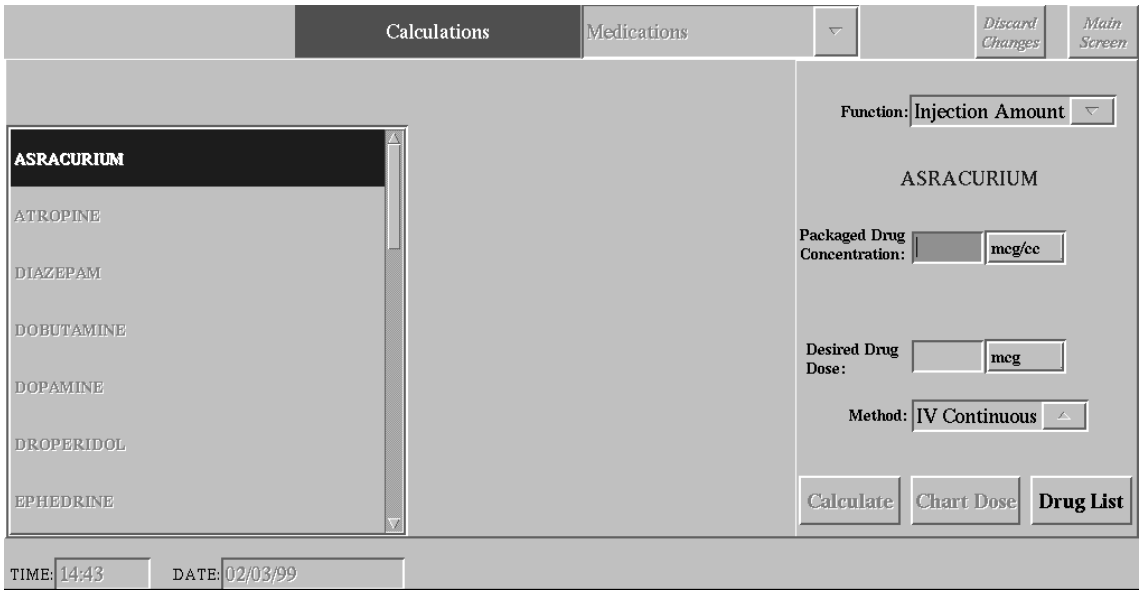


Figure 12-6: Injection Amount Data Entry

The display requests information regarding the packaged drug concentration/ amount, the prescribed dose and the method of injection.

3. Enter all requested parameters.
4. Select the delivery method:
   - IV Continuous
   - IV Bolus
   - IM (Intramuscular)
   - SC (Subcutaneous)
   - PO (Per Os)
   - NG/ND (Nasogastric/Nasoduodenal)
5. Press the **Calculate** button. The Injection amount is calculated and displayed.

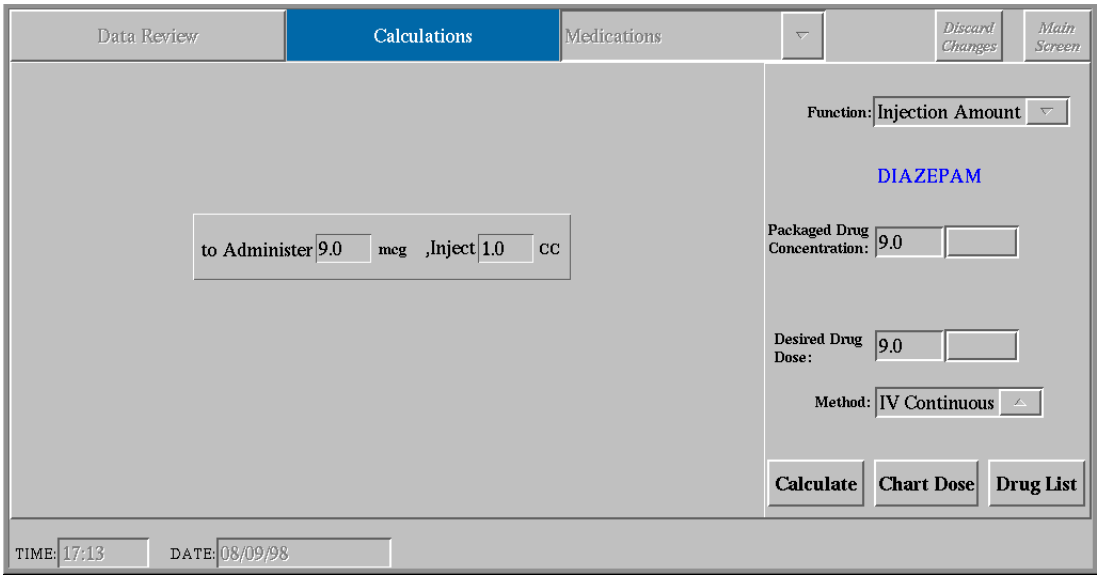


Figure 12-7: Injection Amount Calculation

Note: *The medication, delivery method and injection amount are charted in the Medication Chart.*

CHAPTER 13:
RECORDING VITAL SIGN DATA

The vital sign data of a monitored patient can be recorded in one of the following ways:

Waveform recordings - vital sign waveforms such as ECG, RESP, and BP provide continuous indication of a patient's condition. They are recorded on a chart recorder in the form of 40mm strips. Chart recorder strips serve as the printed patient record for overall documentation, indication of unexpected events, notification and general off-line patient status review.

Alarm recordings - When "Record" is enabled in the "Alarm Response" panel for a monitored vital sign, a waveform of the vital sign is recorded whenever there is an alarm event.

Charts and Trends - All vital sign data for a patient can be collected and presented in the form of charts or trends reports. These reports are printed out on laser printers connected to the Menntor X7 through a network.

This chapter deals mainly with waveform and alarm recordings. For more information about charts and trends, see Chapter 10, "Reviewing Patient Data".

Waveform Recording

The Menntor X7 has optional inbuilt chart recorder. If no inbuilt recorder is installed it supports output to the Enscribe chart recorder. The external chart recorder can print 40mm strips displaying one or two annotated waveforms with pertinent patient information. The inbuilt recorder can print one, two or three waveforms. The Menntor X7 can be connected directly to a dedicated chart recorder or, when connected to a network, can "share" chart recorders with other bedside monitors on the same network.

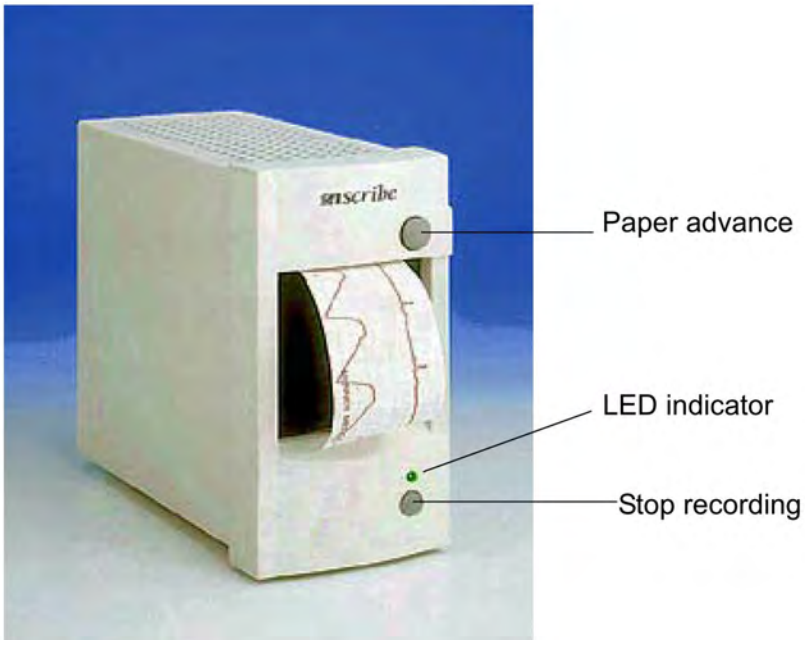


Figure 13-1: The Enscribe Chart Recorder

On the rear panel of the Enscribe chart recorder is the on/off switch. The front of the recorder includes two buttons:

- Paper advance - press to advance paper
- Stop record - press to stop recording

A LED indicator lights when the recorder is on.

Timed Vs. Continuous Recording

Depending on how your Menntor X7 is configured, a waveform may be printed out as a *timed* or *continuous* recording. A timed recording terminates after a pre-defined time period which is configured in System Setup by your system administrator or hospital Biomedical Engineer. In a continuous recording, once begun, recording continues until it is instructed to stop. Depending on the recording type, you can stop a recording by pressing a button on a dialog panel, or by pressing the Stop button on the Chart Recorder itself.

Real-Time Vs. Delayed Data Recording

Depending on how your Menntor X7 is configured, a waveform may be printed out in *real-time* or as a *delayed* recording. Real-time data is continuously generated by the bedside monitor, and passed, for review and documentation purposes, to various peripheral equipment, such as the Central Station, Recorders or other display stations. Delayed data is data previously acquired, intended to capture patient’s events that occured seconds before the recording started.

Recorder Status Indication

Upon initiating a recording, if the recorder is not ready or out of paper the recorder icon will appear on the top, right corner of the screen.

When The "Selective Recording" panel is opened a visual indication of the recorder status is displayed on the panel.

The following are a list of the different indications:

- Recording in progress
- Designated recorder(s) not found
- Recorder busy
- Recorder out of paper
- Recorder door open
- Recorder fault

CAUTION! *If the recorder is not functioning, or out of paper, recordings will be stacked in the monitor. When the recorder will return to work, all the stacked recordings will be recorded sequentially and a lot of recording paper will be wasted.*
In such case it is recommended to "Delete All Recordings" by using the relevant key in "Patient Data"

Anatomy of the Recorder Strip

The length of the chart recorder strip is determined by the length of time a waveform is recorded. The strip consists of three major areas: a header, the waveform area, and a footer.

Header

The header contains a single annotation line containing relevant information pertaining to the recording. The annotation line appears horizontally along the upper edge of each recording. The following information appears in the annotation line:

Bed/Room Name/ Number	The patient’s room number. This is proceeded by the indicator “RM”.
Patient Name	The name of the monitored patient. This may contain up to 16 characters. If the patient’s name is longer, only the first 16 characters appear on the strip.

Reason for Recording	May be one of the following: • Manual • Alarm • Multi-ECG • Selective • All Waveforms
Waveform Scaling Information	Some ECG lead and BP waveforms require information about scaling in order to facilitate comprehension of the displayed information. Such waveforms will contain this information within triangular parentheses (“<“ and “>”). A slash (“/”) serves as a separator between channels. • ECG leads - <*n* mm/mv> (where n represents a number) • BP - <highscale/lowscale> For example, when recording ECG with ART: <5 mm/mv>/<300-0>
Date/Time of Recording	The date/time when recording started. The date/time will appear in the format defined in System Configuration.
Vital Signs Numeric Values	Each waveform recording is accompanied by a set of Vital Sign readings taken at the time of recording. They are displayed in descending order of importance. Each VS is represented by its abbreviated name (e.g. ART for Arterial blood pressure, or HRT for heart rate). The monitored value appears to the right of the VS name. An additional character represents the VS alarm status: “a” indicates that the vital sign is in alarm “s” indicates that the vital sign is in suspended alarm state.

Waveform Area

A waveform recording on Enscribe may include a single grid with one or two overlapping waveforms, or a dual grid where the maximum excursion of a waveform is 20mm.

On the inbuilt recorder it may include one, two or three non-overlapping waveforms..

Footer

The footer appears along the lower edge of the recording strip and contains the following information maintained by the recorder: time markers, elapsed time, and current paper speed.

Assigning a Chart Recorder to the Menntor X7

If the Menntor X7 is not equipped with an inbuilt strip chart recorder, a network chart recorder can be assigned to the Menntor X7 in one of three ways:

- **Dedicated Recorder**

  A single, pre-defined Chart Recorder is selected from a list of available recorders. All waveform recordings will be sent to this recorder only.

- **Pooled Recorders**

  Up to three pre-defined recorders. The waveform is printed on the first available recorder.

- **Duplicated Recorders**

  A list of up to three pre-defined recorders. When recording is initiated, the recording is sent to all the recorders simultaneously. Such a recording can be cancelled only on a specific chart recorder by pressing the Stop button on the active recorder.

Chart recorders are assigned to the Menntor X7 in System Setup by authorized personnel only.

Note: *If an inbuilt recorder is available, all recordings will be performed on the inbuilt recorder and/or Enscribe network recorders.*

Recording Types

The system supports different types of recording:

- Manual
- Alarm
- Multi-ECG
- Selective
- All Waveforms

Manual Recording

A waveform recording can be made at any time by selecting the Main menu, from the Main menu selecting Utility and then pressing the Record key. The recording is sent to a chart recorder as defined in the Menntor X7 system setup. Pressing again the Record key while recording is in progress terminates the recording successfully. Consult your System Administrator or Hospital Biomedical Engineer for the locations of your assigned chart recorders.

Vital Sign Alarm Recording

When connected to a chart recorder, the Menntor X7 can record alarm events to document the transition from a normal state into the alarm condition.

The recording shows several seconds of information prior to the transition and an equal amount of time after that transition.

When "Record" is enabled in the "Alarm Response" panel for a monitored vital sign, a waveform of the vital sign is recorded whenever there is an alarm event.

➤ ***To enable recording of a vital sign alarm:***

1. In the menu of the appropriate vital sign, select **Alarm Response**.
2. Select the **Record** check box. If there is more than one alarm (for example, in **Respiration**, there are two alarms available - **Respiration Rate** and **Apnea**), select the check box for each alarm or only for the alarm that you want to be recorded.
3. Click **Main Screen** to apply the changes and close the panel.

When an alarm condition is detected, the Menntor X7 automatically records the ECG waveform and the waveform of the vital sign which triggered the alarm condition (if other than ECG).

Multi-ECG Recording

A multi-ECG recording contains the waveforms of all monitored ECG leads. The ECG leads are recorded in a series of 5 sec. waveforms. Recording stops automatically at the end of the series. You can stop recording at any time by pressing the Stop button on the Chart Recorder.

➤ ***To initiate a Multi-ECG recording:***

1. On the Menntor X7 Main menu, press the **Patient Data** key.
2. From the **Patient Data** menu, select **Selective Recording**.

3. Select the Multi-ECG check box. Recording is initiated on the associated chart recorder and a message appears on the Selective Recording panel, “Recording now in progress”.

Selective Recording

A selective recording allows you to select two waveforms from all those available and record them on a dedicated Chart Recorder. The recording is continuous, meaning that once recording has begun, it will continue until you instruct the Menntor X7 to stop recording.

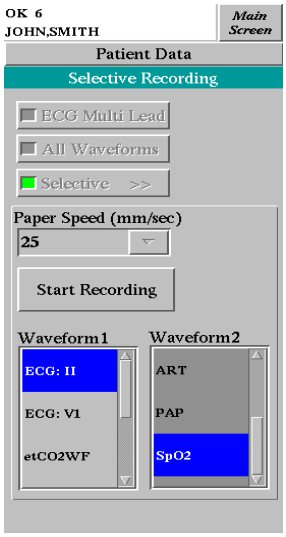


Figure 13-2: Performing Selective Recording

➤ ***To perform a selective recording:***

1. On the Menntor X7 Main menu, select the **Patient Data** key.
2. From the **Patient Data** menu, select **Selective Recording**.
3. Select the **Selective** check box.
4. In the **Paper Speed** list, select the required paper speed.
5. In the **Waveform1** list, select the first waveform.
6. In the **Waveform2** list, select the second waveform.
7. With an Inbuilt recorder select **Waveform3** list.
8. Press **Start Recording**. Recording begins and the button changes to **Stop Recording**. Press **Stop Recording** to stop the continuous recording.

All Waveform Recording

An All Waveform recording contains all displayed clinical waveforms. Waveforms are recorded in a series of 5 sec. waveforms. The recording shows several seconds

of information prior to initiating the recording. Recording stops automatically at the end of the series. You can stop recording at any time by pressing the Stop button on the Chart Recorder.

➤ ***To perform an All Waveforms recording:***

1. On the Menntor X7 Main menu, select the **Patient Data** key.
2. From the **Patient Data** menu, select **Selective Recording**.
3. Select the **All Waveforms** check box. Recording is initiated on the associated chart recorder and a message appears on the Selective Recording panel, “Recording now in progress”.

SECTION 3
VITAL SIGNS MONITORING

This section contains chapters describing monitoring procedures for all vital signs available for monitoring on the Menntor X7 monitor.

These vital signs are:

1. Chapter 14: ECG
2. Chapter 15: Arrhythmia
3. Chapter 16: ST Segment Analysis
4. Chapter 17: Respiration
5. Chapter 18: Invasive Blood Pressures (BP)
6. Chapter 19: Cardiac Output (C.O.)
7. Chapter 20: Temperature
8. Chapter 21: Non-Invasive Blood Pressure (NIBP)
9. Chapter 22: Pulse Oximetry (SpO2)
10. Chapter 23: End Tidal CO2 (EtCO2) Microstream /MicroPod™

CHAPTER 14: ECG

Overview

The Menntor X7 monitor uses 12 Lead ECG/Resp technology via electrodes attached to the patient's chest. Monitoring the ECG produces a continuous waveform of cardiac electrical activity to enable an accurate assessment of a patient's current physiological condition. You can use ECG cables with 3, 5, 6 or 12 lead electrode to display up to twelve selectable ECG leads.

Figure 14-1: Continuous Monitored ECG Waveform Display

Note: *If one or more leads is disconnected from the patient, a Lead Fault message is displayed, within 1 second, in the ECG area and a Technical Alarm is issued.*

ECG Deactivation

As a general rule, ECG is always the top displayed vital sign.

If ECG is deactivated, the following ECG sub-parameters is not available:

ST, Arrhytmia, PR/QT

The following ECG related menu items are dimmed and inactive.

- **ST Watch** entry
- **ECG Full Disclosure**
- **HRV Histogram**

The monitor stores Heart Rate from SpO2 or ART in Charts.

QRS Detection

Mennen Medical QRS detection algorithm is based on the characteristics of the QRS morphology and thus eliminates the sensing of T waves. Beats are marked as Normal or Ventricular and these QRS marks are used for arrhythmia detection and alarms.

ECG LED Indicator

The LED indicator on the front panel describes the following functions:

Status	*Indication*
LED is green and blinking	QRS detected
LED is red and blinking	Passive lead fault
LED is red and on	“all fault” or “active lead fault” error detected

Patient Preparation

Following are the accepted procedures for positioning ECG electrodes. Optimal placement sites may vary from patient to patient depending on physiological characteristics and condition. In many cases you can improve received ECG signals by repositioning one or more electrodes. Chest placement of electrodes provides the best results since there are fewer skeletal muscles to cause artifact.

When placing the electrodes on the patient, take care to avoid areas of pressure. Skin breakdown may occur if the patient lies on the ECG electrodes or cables. In order to prevent skin irritation, follow the hospital procedures for the duration of use, and replacement, of the ECG electrodes.

ECG Electrodes

- Use high quality disposable electrodes for patient monitoring
- Follow the electrode manufacturer instructions for use
- Use electrodes that are within the use period
- Discard electrodes that are out of date
- If the electrodes are supplied in bulk, mark the date of package opening

- Follow manufacturer recommendation for duration of use after opening the packaging

CAUTION! *Using dried electrodes may result in a noisy and unstable ECG waveform.*

ECG Artifact

When an artifact is detected in one of the two top displayed leads, a warning message "Artifact" is displayed in red in the ECG area; and QRS detection is performed only on the "good" lead.

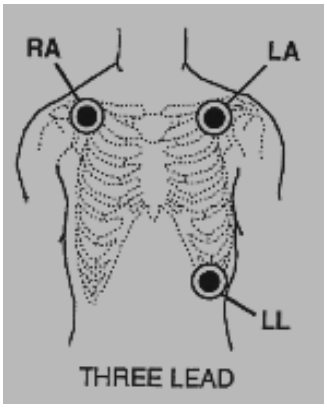
When an artifact is detected in both of the two top displayed leads or when only one lead is displayed and has an artifact, then the system shows a "severe" artifact in white letters on a red background and all ECG analysis is stopped - in such a case, dashes (----------) are displayed instead of the HR.

Note: *Excessive noise may prevent or interrupt the reliable detection of the QRS complex in each of the top displayed leads.*

If the level of noise in one of the two top displayed leads, is such that it prevents reliable detection of QRS, a message entitled ***"Artifact"*** *in red letters on a black background will be displayed, and Heart Rate counting will continue on the unaffected lead.*

If the level of noise in both of the two top displayed leads, is such that it prevents reliable detection of QRS, a message entitled ***"Artifact"*** *in white letters on a red background will be displayed, and Heart Rate counting will stop. The Heart Rate numerical area will be displayed in dashes.*

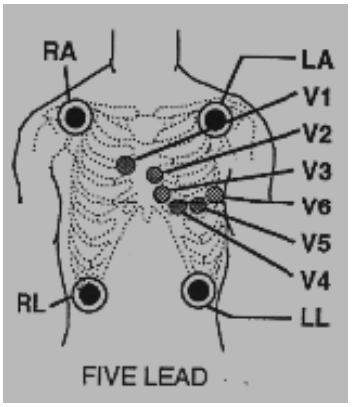
Adult Electrode Placement



Three Lead Cable Electrode Placement:

RA (white) - Midclavicular on Right
LA (black) - Midclaviculat on Left
LL (red) - Ground, 6th or 7th intercostal space on left, midclavicular line

Figure 14-2: Three Lead Electrode Placement



Five Lead Cable Electrode Placement:

RA (white) - Right midclavicular line, directly below clavicle.
LA (black) - Left midclavicular line, directly below clavicle.
RL (green) - 6th or 7th intercostal space, on right midclavicular line.
LL (red) - 6th or 7th intercostal space, on the left midclavicular line.
C (brown) - On the patient's chest. Place on one of the V positions.

V1 - Fourth intercostal space, at right sternal margin.
V2 - Fourth intercostal space, at left sternal margin.
V3 - Midway between V2 and V4.
V4 - Fifth intercostal space, at midclavicular line.
V5 - Same level as V4 on anterior axillary line.
V6 - Same level as V4 on mid-axillary line.

Figure 14-3: Five Lead Electrode Placement

1. If necessary, shave the area where the electrode is to be placed.
2. If necessary, rub the area with a gauze pad or fine sandpaper to lower skin resistance.
3. Clean the area with an alcohol pad to remove residue and skin oils.
4. Dry the skin.
5. Snap the lead wires to the electrodes before placing them on the patient's chest.
6. Place the electrodes on flat, bony areas avoiding fat or muscle.
7. Tape wires to provide strain relief.

After preparatory procedures are completed and the electrodes are in place, connect

the ECG cable to the green input socket on the front of the monitor

Neonatal Electrode Placement

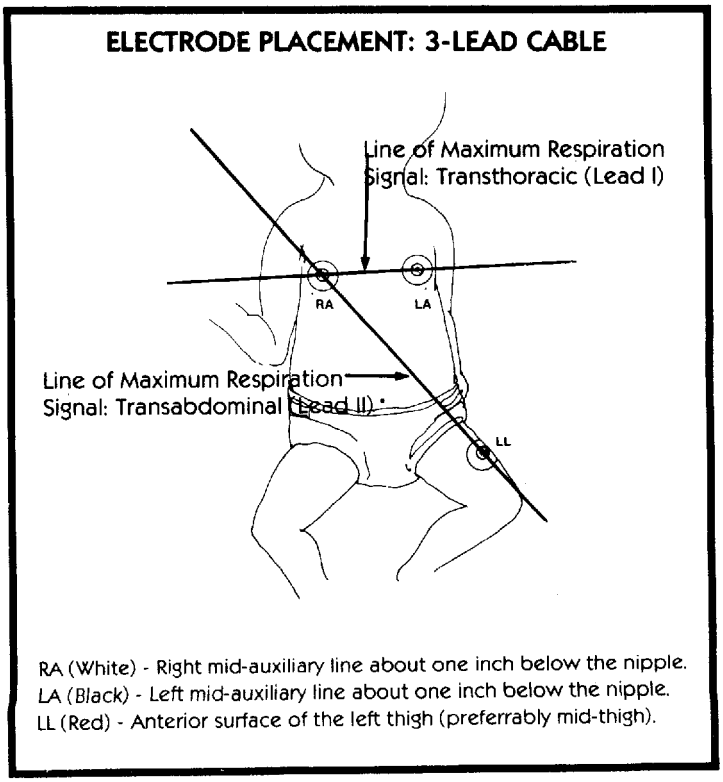

ELECTRODE PLACEMENT: 3-LEAD CABLE
Line of Maximum Respiration Signal: Transthoracic (Lead I)
RA
LA
Line of Maximum Respiration Signal: Transabdominal (Lead II)
LL
RA (White) - Right mid-auxiliary line about one inch below the nipple.
LA (Black) - Left mid-auxiliary line about one inch below the nipple.
LL (Red) - Anterior surface of the left thigh (preferrably mid-thigh).

Figure 14-4: Three Lead Neonatal Electrode Placement

1. Clean the area where the electrode is to be placed.
2. Dry the skin.
3. Attach the lead wires to the electrode prior to placement.
4. Place electrodes over flat, bony areas (not over fat).

After preparatory procedures are completed and the electrodes are in place, connect the ECG cable to the green input socket on the front of the monitor.

ECG Monitoring Checklist

- Plug the patient cable into the ECG socket.
- Prepare the patient, attach clip or snap to electrode and attach to patient.

Note: *If you do not receive a good ECG waveform, and all electrodes are correctly and securely positioned, change the lead.*

Note: *If EtCO2 is active, then Respiration Measurement by impedance pneumography is disabled.*

ECG Monitoring Procedures

Intereaction with all aspects of ECG monitoring is via the **ECG** menu which provides access to the specific dialog panels. Each dialog panel enables control of different ECG monitoring aspects. In order of appearance on the ECG menu, the available panels are:

- **Leads/Gain Panel**

  Use this panel to select the monitored ECG leads and gain. See “Setting ECG Leads & Gain Parameters” on page 14-8.

- **Alarm Limits Panel**

  Use this panel to activate or deactivate ECG alarms and set alarm limits. See “Activating ECG Alarms and Setting ECG Alarm Limits” on page 14-12.

- **Alarm Response Panel**

  Use this panel to define how the bedside monitor responds to ECG alarms. See “Setting ECG Alarm Response Parameters” on page 14-14.

- **Relearn**

  Use this key to cause the QRS detection algorithm to Relearn. This is useful if the QRS shape is slightly abnormal, but not ventricular

- **ECG Report**

Use this panel to define an ECG report printout in the format of 3 x 4 + rhythm strip.

Note: *ECG report has to enabled in System Setup >> VS >> ECG setup*

- **Display Options Panel**

  Use this panel to define the way ECG waveforms and values are displayed on the main screen. See “Setting ECG Display Options” on page 14-17.

- **QRS Tone Volume**

  Use this panel to configure the monitor to provide an audible tone whenever a QRS is detected. See “Setting QRS Tone Volume” on page 14-18.

- **Pacemaker Detection Panel**

  Use this panel to control the detection of cardiac pacemaker pulses. See “Detecting a Pacemaker” on page 14-20.

- **Heart Rate Source Panel**

  Use this panel to define the source of the heart or pulse rate. See “Setting the Heart Rate Source” on page 14-23.

- **Filter Panel**

  Use this panel to select a filter to “clean” any environmental noise from the displayed waveform. See “Selecting a Filter” on page 14-24.

- **Arrhythmia**

  Use this key to open the arrhythmia menu

Note: *This key is available only if the arrhythmia option is enabled in the System Setup.*

- **ST Analysis**

  Use this key to open the ST menu.

Note: *This key is available only if the ST option is enabled in the System Setup.*

- **PR/QT**

  Use this key to open PR/QT menu. See “PR / QT Measurement” on page 14-28.

- **All ECG Leads**

  Pressing this button will dispaly all ECG leads for a pweriod of 2 minutes. Use Main Screen to return to the standard display.

All ECG panels can be accessed from the **ECG** menu or from the drop-down menu list below the title area in any ECG panel.

Accessing the ECG Menu

Access the **ECG** menu from the **Vital Signs** menu or from the main screen display.

➤ ***To access the ECG menu from the Vital Signs menu:***

- From Main menu select the **Vital Signs** key and select **ECG** from the **Vital Signs** menu. The **ECG** menu is displayed.

➤ ***To access the ECG menu from the main screen display:***

- Turn the QuicKnob™ until the **ECG** parameter key is highlighted and press. The **ECG** menu is displayed.

Setting ECG Leads & Gain Parameters

Lead

The type of ECG traces displayed on the monitor depends on the type of cable used. The 3-lead cable provides a single channel. A 5-lead set provides the following choice of leads: I, II, III, aVR, aVL, aVF and V1. A 6-Lead cable provides also V2. A 12-lead set provides: I, II, III, aVR. aVL, aVF, V1, V2, V3, V4, V5 and V6.

The number of leads displayed is configurable, but this is limited by the actual space alloted to ECG in **Screen Format**. The displayed leads can be changed at any time.

The characteristics of a good signal are as follows:

- The R-wave should be tall and above or below the baseline.
- Tall and narrow with no notches.
- The T-wave should be less than 1/3 the height of the R-wave.
- The P-wave should be much smaller that the T-wave.

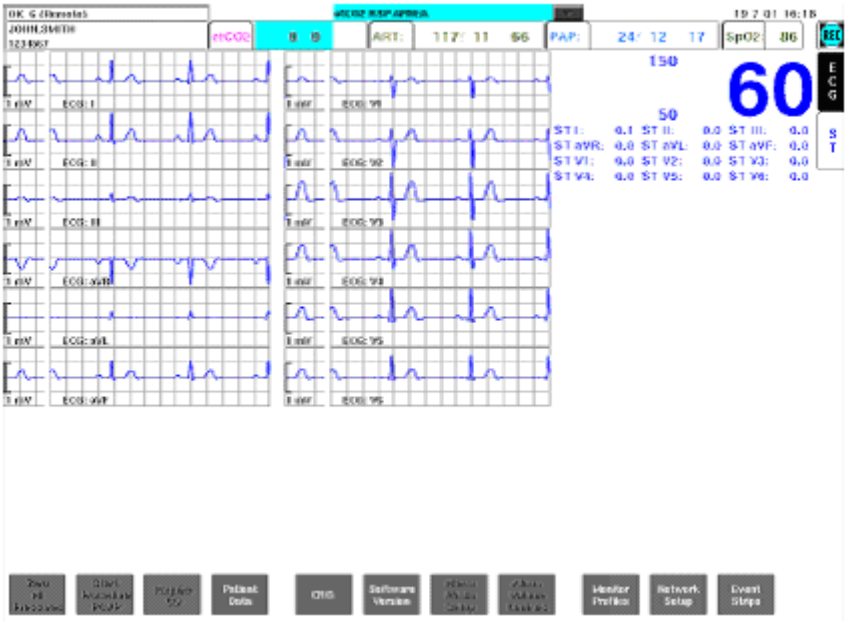


Figure 14-5: Main Screen Displaying 12 ECG Traces

Gain

Gain controls the amplitude of the displayed waveform. The gain for each lead can be defined individually, or all leads can be set to the same gain. The following gain values are available: 1/4, 1/2, 1, 2, 4, and 8. The default gain value is 1.

Note: *The ECG gain, effects only the waveform display and does not influence the QRS sensing. QRS sensing is effective for QRS amplitude of at least 0.25 mVolt and up to an amplitude of 5 mVolts. If you use gain X 4 with an amplitude of about one cm, the QRS sensing will not be reliable.*

CAUTION! *To obtain reliable ECG Heart Rate Counting and QRS identification, it is recommended to select the ECG lead with an amplitude of 0.5 mVolt and above. The monitor specification allows QRS detection for QRS amplitude in the range of 0.25 to 5 mVolt.*
QRS amplitude changes with body position and respiration and it is thus not safe to monitor heart rate when the QRS amplitude is just above 0.25 mVolt.
It is important to note that the display gain does not change the sensitivity of QRS detection. Thus an amplitude of 1 cm with a gain of x4 may look good but will provide unreliable sensing and high sensitivity to muscle noise. Menntor X7 *sense the QRS in the two top displayed leads. It is thus recommended, wherever practical, to use a five lead ECG cable with display of two leads.*

Show Channels

The number of available channels (one to seven) varies according to which lead cable is used. The number of channels depends on available display space. Unavailable leads are disabled. The default choice list contains channels A and B: A for lead II , B for lead Va with common gain 1.

Set All to Same Gain

Use this feature to set all leads to the same gain used in trace A.

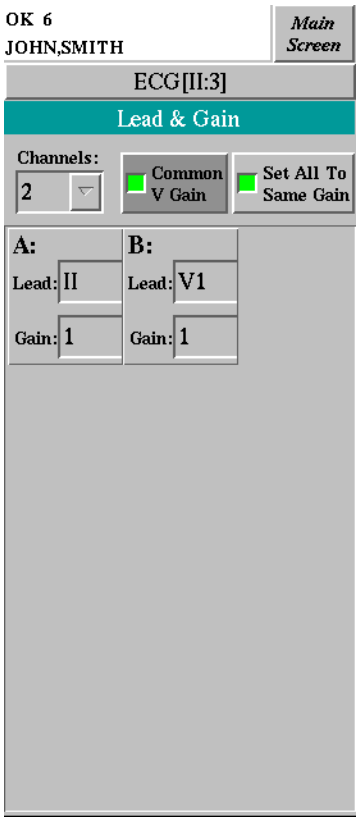


Figure 14-6: ECG Lead/Gain Panel

Set V Lead to Same Gain

Use this feature to set all V leads to the same gain.
Changing one of the V lead gains will affect all V leads.

➤ ***To set ECG leads and gain parameters:***

1. From the **ECG** menu
   –or–
   if you are already in another ECG dialog panel, from the drop-down menu list below the panel title area, select **ECG Lead/Gain**. The **ECG Lead/Gain** dialog panel appears.
2. From the **Show Channels** drop-down list, select the number of channels to be displayed. The corresponding data appears on the panel.

3. From the **Lead** drop-down list, select the lead to be displayed. Only those available for use are displayed. The selected lead immediately appears on the main screen display. If a lead displayed in another trace is selected, the leads and respective gains are exchanged.
4. From the **Gain** drop-down list, select the required gain.
5. Select the **Set All to Same Gain** checkbox to set all lead gains to that selected in trace A. When activated, the checkbox appears green.
6. Press **Vital Signs** to return to the Vital Signs menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Setting ECG Alarms

ECG alarm parameters are set in two dialog panels, **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of ECG alarms. ECG alarms are activated and alarm limits are set in the **Alarm Limits** panel. Set alarm limits according to the patient's clinical condition.

Activating ECG Alarms and Setting ECG Alarm Limits

The **Alarm Limits** panel contains a slider bar with two markers for setting low and high alarm limits. Limit values can be set between 20 and 350 beats per minute (BPM). You can also configure the monitor to automatically set default alarm limits. Default values are defined in System Configuration. Heart Rate alarm default limits are 50-150 BPM. A heart rate of less than 20 BPM is displayed as 0.

Note: *For proper QRS detection, the upper heart rate alarm limit should not be set to more than 20BPM above the patient's current heart rate.*

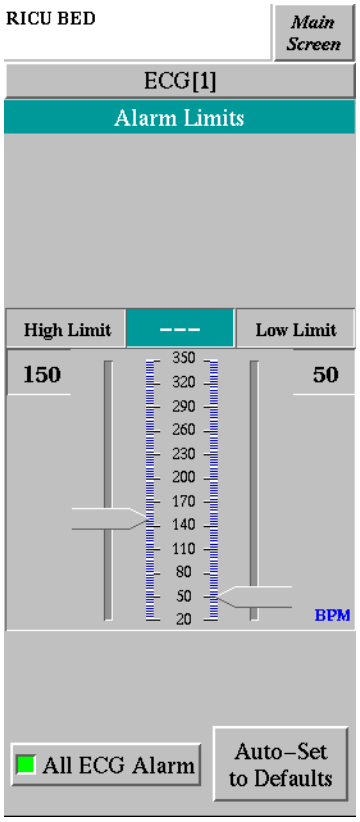


*Figure 14-7: ECG **Alarm Limits** Panel*

➤ ***To activate ECG alarms and set ECG alarm limits:***

1. From the **ECG** menu, select ECG **Alarm Limits**
   –or–
   if you are already in another ECG dialog panel, in the drop-down list below the title area, select ECG **Alarm Limits**. The ECG **Alarm Limits** panel appears.
2. Select the **All ECG Alarms** checkbox to activate or deactivate both high and low limit alarms.

   Note: *When **All ECG Alarms** is deactivated, the slider bars used for setting alarm limits are disabled.*

3. Set the low and high limit values by turning the QuicKnob™ until the required scale is highlighted. Press the QuicKnob™ and turn, in step of 5/min, until the correct limit is set. Turn the QuicKnob™ while pressing to set limits in increments of 1/min; the limits you have set appear in the **Low Limit** and **High Limit** values areas on the panel.
   –or–
   Press **Auto-Set to Defaults** to set alarm limits to default values.
4. Press **Vital Signs** to return to the Vital Signs Menu
   –or–
   Press **Main Screen** to return to the main screen display.

Setting ECG Alarm Response Parameters

The ECG **Alarm Response** panel enables you to define how the Menntor X7 responds to ECG heart rate, pacemaker and lead fault alarms. The Menntor X7 can be set to emit an audible message, record monitored vital signs at the time of the detected alarm or both.

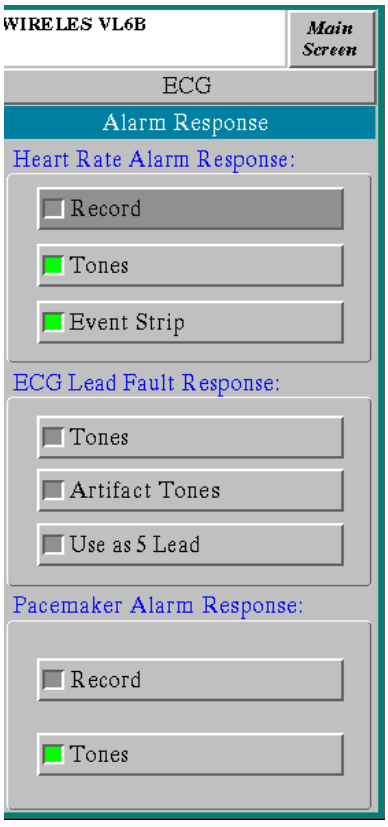


Figure 14-8: The ECG Alarm Response Panel

➤ ***To set ECG Alarm Response parameters:***

1. From the ECG menu
   –or–
   if you are already in another ECG dialog panel, from the drop-down menu list below the panel title area, select ECG **Alarm Response**. The **Alarm Response** panel appears.
2. Under **Heart Rate Alarm Response**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition at the time of the heart rate alarm event.
   - Select the **Tones** checkbox to activate or deactivate audible alarm indication.
   - Select the **Event Strip** checkbox to activate or deactivate the Event Strip.
3. Under **ECG Lead Fault Response**:
   - Select the **Tones** checkbox to activate or deactivate audible alarm indication.
   - Select the **Artifact Tones** checkbox to activate or deactivate audible alarm indication on artifact that prevents HR counting (red background artifact).
   - Select the **Use as 3 Lead** checkbox to activate or deactivate the feature. When activated, the monitor uses a reduced ECG set regardless of the lead being used. A notification message (**Only leads RA, LA & LL are used**) apppears in the message area on the main screen display.
   - For **ECG 12 Lead** cable, Select the **Use as 5 Lead** checkbox to activate or deactivate the feature. When activated, the monitor uses a reduced ECG set regardless of the lead being used.
4. Under **Pacemaker Alarm Response**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's monitored vital signs at the time of the alarm.
   - Select the **Tones** checkbox to activate or deactivate audible alarm indication.

   Note:*Checkboxes appears green when activated and gray when deactivated.*
5. Press **Vital Signs** to return to the **Vital Signs Menu**
   –or–
   Press **Main Screen** to return to the main screen display.

Setting ECG Report

You can now either print a report of 3 x 4 ECG strips plus one rhythm strip, or if the Mennen-Net is connected to a server, also save the report to the server.

➤ ***To print and/or save the ECG report:***

1. From **ECG** menu select **ECG Report.**

The ECG report setup dialog appears.

Use this panel to select the Rhythm lead and to direct the report, either to the printer or, if the Mennen-Net is connected to a server, also or only to the server.

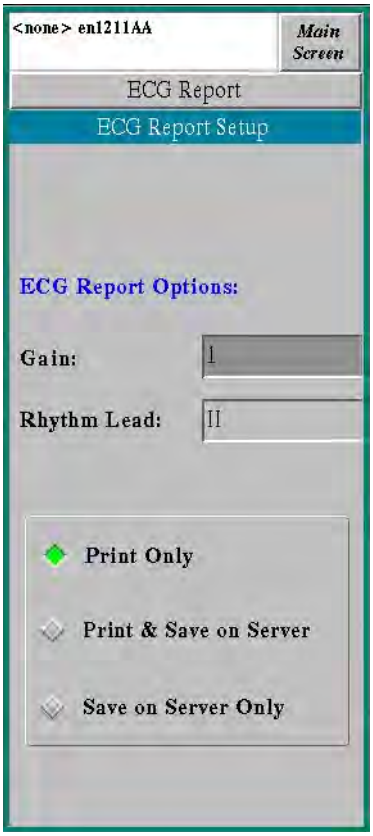


Figure 14-9: ECG Report Setup Panel

Setting ECG Display Options

The ECG Display Options panel enables the user to change the way ECG waveforms and values are displayed on the main screen. Any changes made are immediately reflected on the main screen.

The minimum ECG slot on the main screen display is 30mm. The minimum waveform height is also 30mm. The ECG default display color is yellow but can be changed to any color available. All ECG leads area displayed in the same color.The monitor can be configured to display the waveform on a grid. The lead ID is displayed next to each trace. Calibration Pulse and Gain factor can also be displayed.

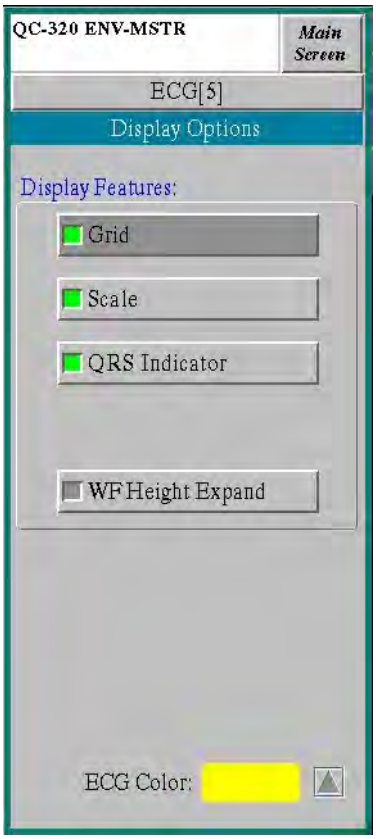


Figure 14-10: ECG Display Options panel

➤ ***To set ECG Display Options:***

1. From the ECG menu
   –or–
   if you are already in another ECG dialog panel, from the drop-down menu list below the panel title area, select ECG **Display Options**. The **Display Options** dialog panel appears.
2. Under **Display Features**:
   - Select the **Grid** checkbox to activate or deactivate display of the waveform on a grid. By default, this option is deactivated.
   - Select the **Scale** checkbox to activate or deactivate display of the gain value and calibration pulse in the waveform area. By default, this option is deactivated.
   - Select the **QRS Indicator** checkbox to activate or deactivate display in the Primary Vital Sign area on the main screen of a blinking red heart every time a QRS is detected. By default, this option is deactivated.
3. From the **ECG Color** drop-down list, select the color required to display ECG waveforms and other parameters. The default color is yellow.
4. Press **Vital Signs** to return to the Vital Signs Menu
   –or–
   Press **Main Screen** to return to the main screen display.

   Note:*Checkboxes appears green when activated and gray when deactivated.*

Setting QRS Tone Volume

The monitor can be configured to provide an audible QRS tone whenever a QRS complex or pulse trigger is detected. QRS tone volume is set in the **QRS Tone Volume** panel using a slider bar which can be set on a scale ranging from Off (meaning that the QRS tone is deactivated) to 10. See “Setting ECG Display Options” on page 14-17 to activate visual display of the QRS indicator.

Note: *It is not necessary to activate a visual QRS indicator in order to activate the QRS tone and vice-versa.*

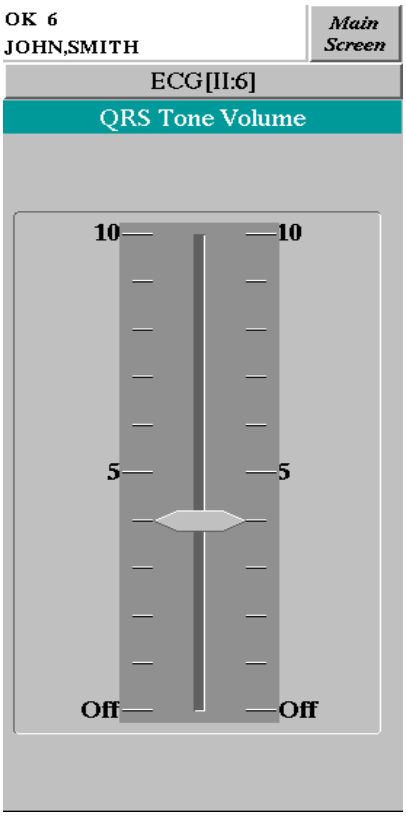


Figure 14-11: The ECG QRS Tone Volume Panel

➤ ***To set QRS tone volume:***

1. From the ECG menu
   –or–
   if you are already in another ECG dialog panel, from the drop-down menu list below the panel title area, select ECG **QRS Tone Volume**. The **QRS Tone Volume** dialog panel appears.
2. Turn the QuicKnob™ until the scale is highlighted and press. Turn the QuicKnob™ clockwise or counterclockwise until the correct volume for the QRS tone is set. Set the scale to **Off** in order to deactivate the QRS tone.
3. Press **Vital Signs** to return to the Vital Signs Menu
   –or–
   Press **Main Screen** to return to the main screen display.

Detecting a Pacemaker

The Pacemaker Detection panel enables you to control the detection of cardiac pacemaker pulses.

Three options are available for pacemaker detection:

- Fixed - In the Fixed mode the sensitivity of pacer spike detection is fixed at 2 mV for 0.2 to 2.0 mSec pulse width.
- Adaptive 1 - In the Adaptive 1 mode the ECG adapts its threshold sensitivity to the spike amplitude. It provides lower threshold (higher sensitivity) down to 0.5 mV for 0.2 to 2.0 mSec pulse width.
- Adaptive 2 - In the Adaptive 2 mode the ECG adapts its threshold sensitivity to the noise amplitude. This mode provides the same minimum threshold as the Fixed mode and increases the threshold if noise interferes with the pacer spike detection (higher immunity). Minimum threshold is: 2.0 mV for 0.2 to 2.0 mSec pulse width.

Lead selection

Select one of the following leads to monitor pacemaker pulse detection:I, II, III, or V1.

Note: *Calculated leads (aVR, aVL, and aVF) cannot be selected for pacemaker detection.*

When pacemaker detection is activated, the pacemaker pulse is incorporated into all ECG waveforms. A pacemaker flag in the form of a vertical red line is inserted whenever the bedside monitor detects the presence of a pacemaker stimulus. The default color for this flag is red, but the color can be changed to be the same as the waveform color.

WARNING PACEMAKER PATIENTS!!! *Rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter ALARMS. Keep pacemaker patients under close surveillance. See the following for disclosure of the pacemaker pulse detection capability of this instrument.*

Note: *Pacemaker Identification is automatic. Pacemaker beats are marked in Full disclosure by "P" without user action. You cannot disable pacemaker beat detection.*

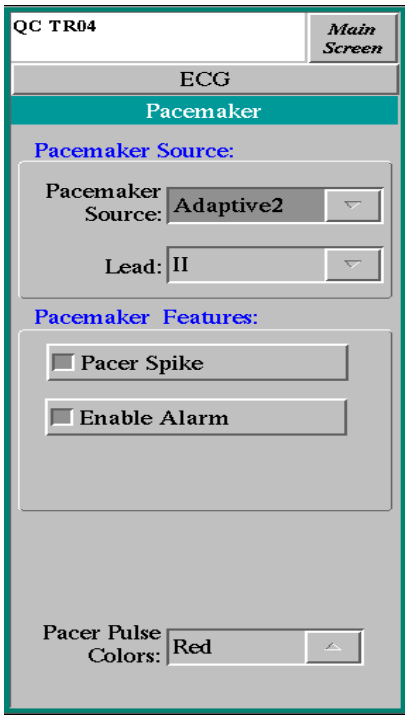


Figure 14-12: Pacemaker Detection Panel

Recommended practice

The pacer spike amplitude in the different ECG leads is not related to the QRS amplitude; thus the selection of the optimal lead for pacer detection is independent of the lead selection for QRS detection.

➤ ***To get the best results in pacer detection***

1. Select the Fixed mode when the pacer is active.
2. Check each of the following leads consecutively - I, II, III, V1.Note which lead gives the best pacer spike detection and select it.
3. Move to Adaptive 1 and continue monitoring in this mode.

Note: *Use Adaptive 2 only when you have a problem with noise. Noise is manifested by spurious spikes which are not related to pacer action.*

➤ ***To set the Pacemaker Detection panel***

1. From the **ECG** menu
   -or-
   if you are already in another ECG dialog panel, from the drop-down menu list below the panel title area, select **ECG Pacemaker Detection**.

The **Pacemaker Detection** dialog panel appears.

2. From the **Pacemaker Source** drop-down list, select either **Fixed** , **Adaptive 1**, or **Adaptive 2** (The default selection is Adaptive 1).
   Select either I, II, III, or V1 from **Lead**.
3. Under **Pacemaker Features**:
   – Select the **Pacer Spike** checkbox to activate or deactivate this feature.
   – Select **Enable Alarm** to activate or deactivate Pacer Alarms.
4. From the **Pacer Pulse Colors** drop-down list, select either **Red** or **WF** color. (The default color is Red).
5. Press **Vital Signs** to return to the **Vital Signs** menu.
   -or-
   Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appears green when activated and gray when deactivated.*

Pacer Alarms

The Menntor X7 activates Pacer alarms when the patient status is defined as "Paced." A "Paced" condition occurs when 5 Paced beats are detected within one minute over the last 10 minutes.

Note: *The Menntor X7 issues Pacer alarms on the assumption that the pacemaker is a "Demand Pacemaker."*

To cancel the definition of a patient as "Paced," select the "Relearn" function in the ECG menu.

Three Pacer alarm messages may occur:

- Pacer Non Capture (ineffective stimulation)

Pacer spike is not followed by QRS.

- Pacer Non Function

QRS rate is lower than the Pacer rate. Spikes are expected but not detected.

- Pacer Non Sense

Demand pacemaker does not sense QRS. Early pacing occurs after normal or premature QRS.

The Alarm continues for 1 minute after the last non-function beat.

Setting the Heart Rate Source

The heart rate derived from a continuously monitored ECG is a measure of the heart's overall electrical activity. The pulse rate is a measure of the heart's mechanical activity, pumping blood around the body.

In certain situations (e.g., due to excessive ECG artifact or the inability to place electrodes on burn patients), it may be impossible to derive an accurate heartrate from the ECG and an alternate heartrate source is required. If a pulsatile pressure(pulse rate) is being monitored (Arterial Blood Pressure or SpO2), this can be selected as the alternate heart rate source.

The source for the Heart Rate value to be displayed is set in the **Heart Rate Source** panel. The available options are: **Heart Rate ECG**, **Pulse Rate SpO2** or **Pulse Rate ABP** (Arterial BP). Only one source can be specified.

Note: *When the heart rate is derived from the SpO2 pulse rate, the heart rate displayed in the ECG waveform appears in the color of its source (the SpO2 display color).*

Figure 14-13: The ECG Heart Rate Source Dialog Panel

➤ ***To select a heart rate source:***

1. From the **ECG** menu
   –or–
   if you are already in another ECG dialog panel, from the drop-down menu list below the panel title area, select **Heart Rate Source**. The **ECG Heart Rate Source** dialog panel appears.
2. Select the required source.
3. Press **Vital Signs** to return to the **Vital Signs** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *If Auto Heart Rate source is activated the heart rate will be taken from the first available reliable source with the following priority: ECG, SpO2, ART.*

Selecting a Filter

A filter that changes the bandwidth (a measure of electrical frequencies contained within an electrical signal) can be selected to "clean" any environmental noise or baseline drift from the displayed waveform. The available options are **Monitor**, **Diagnostic**, and **Exercise**.

- Monitor - This filter is used in normal monitoring conditions. Artifacts which may cause false alarms are filtered out.
- Diagnostic - When this filter is selected, the monitor displays an unfiltered, diagnostic-quality waveform. You can then detect changes in the ECG, such as R-wave notching.
- Exercise - This filter implements a narrower bandwidth for situations where there are many movement artifacts or high interference and environmental "noise".

The default option is **Monitor**. When **Diagnostic** or **Exercise** is selected, a message appears on the main screen display. Only one filter can be specified.

WARNING!!! *Do not try to estimate ST when Monitor or Exercise filters are used.*
Only Diagnostic filter and ST mode provide reliable ECG morphology.

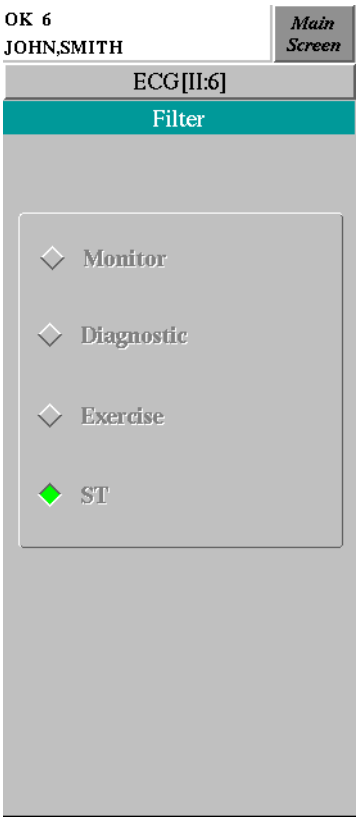


Figure 14-14: The ECG Filter Dialog Panel

➤ ***To set the filter:***

1. From the **ECG** menu
   –or–
   if you are already in another ECG dialog panel, from the drop-down menu list below the panel title area, select **Filter**. The **ECG Filter** dialog panel appears.
2. Select the required filter.
3. Press **Vital Signs** to return to the **Vital Signs** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *When monitoring ST segment, the filter is fixed by default as "ST Filter" and cannot be changed.*

ECG Recording

Use the ECG built-in or network strip chart recorder, to record single or multi-lead ECG.

Each strip includes the Bed number, Patient name, Filter setting, ECG leads, Gain indicator and sweep speed (Default 25 mm/sec) and Date and time of the recording. Numeric Vital signs monitored at the time of recording appear as a list, on the top row of the ECG strip

The area of the recording includes a 1 mm X-Y grid with vertical scale of 20 mm and horizontal grid of 25 boxes per second.

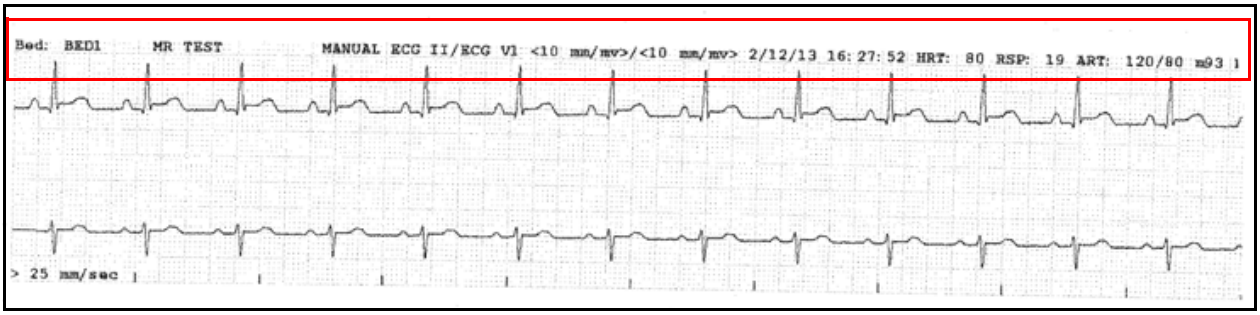


Figure 14-15: ECG Strip, from Strip Chart Recorder

ECG Report Printing

For monitors that are connected to a LAN network that includes a Laser printer, and ECG Report can be printed on the printer.

The report consists of 3 X 4 sections of the 12 leads with 2.5 seconds of each lead and a Rhythm lead of 10 seconds. The vertical area for each lead is 35 mm.

Under the rhythm lead the RR intervals between beats is shown in mSec.

Gain indicator of 10 mm/1 mV is added to the left of each row.

The top row of the report consists of the Patient name, Date & Time, and Bed name

Below the top row there is a list of all numeric vital signs at the time of the report.

The bottom row provides information on Sweep speed, Gain, Filter and place for a signature.

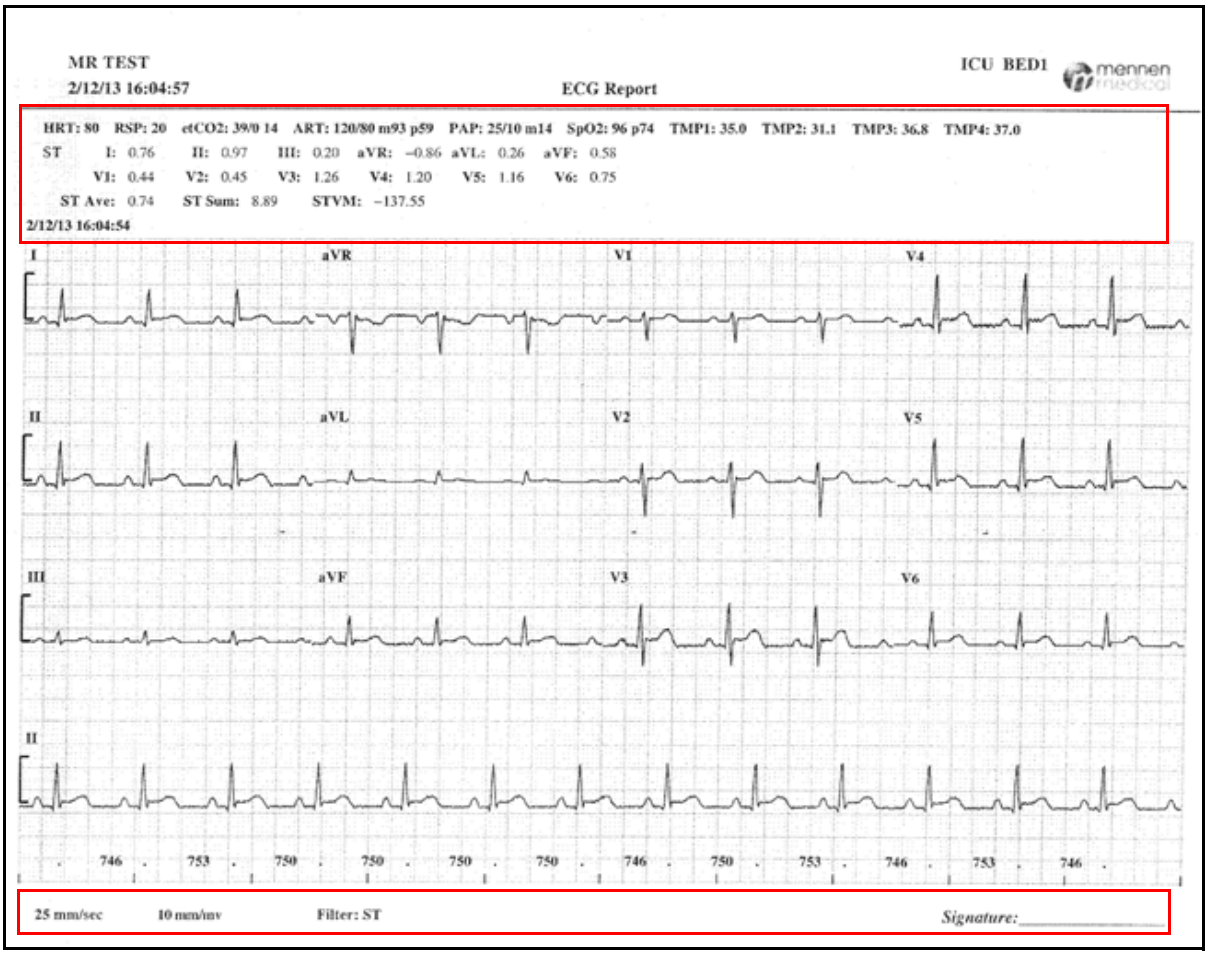


Figure 14-16: ECG Report on Laser Printer

PR / QT Measurement

You can measure the PR and QT intervals manually.

The PR/QT results are displayed with a time stamp and QTc (defined as QT interval / square root of RR interval).

$$QTc = \frac{\text{QT interval}}{\text{Square Root of RR interval}}$$

➤ ***To manually measure the PR and QRT intervls:***

1. From the ECG menu choose **PR/QT**.

2. From the sub-menu choose Measurment.

A measurement panel opens.

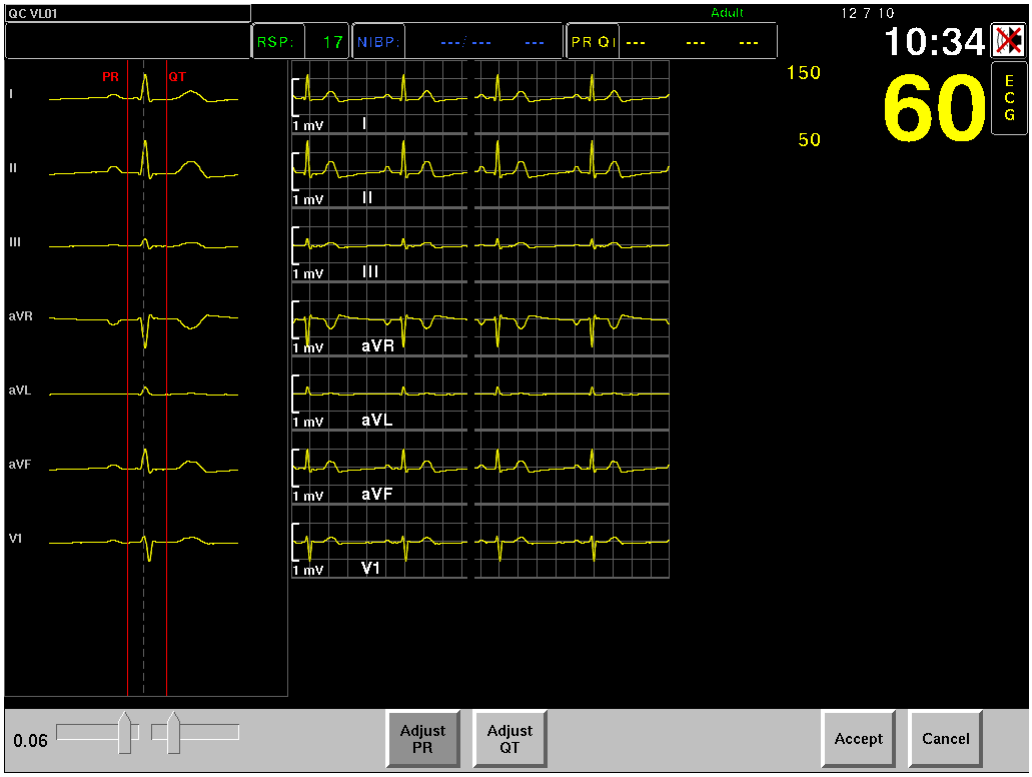


Figure 14-17: PR/QT Measurement Panel

3. Click **Adjust PR** and, using the QuicKnob™, move the PR line to the beginning of the P wave.

4. Click **Adjust QT** and, using the QuicKnob™, move the QT line to the end of the T wave.

5. Press **Accept** to accept the results.

   The result is displayed in either Big Numbers or secondary.

CHAPTER 15: ARRHYTHMIA

Introduction

QRS detection and classification uses a proprietary algorithm that recognizes the QRS and eliminates the sensing of P or T waves. The algorithm marks the beat as: Normal, Ventricular, or doubtful

The Arrhythmia diagnosis is based on the beat classification and the beat to beat intervals

Arrhythmia alarms are detected by the ECG algorithm.

Three levels of Arrhythmia can be monitored according to the configuration of your system:

- **None**

  The Arrhythmia option does not appear on the ECG menu.

- **Basic**

  Only the basic Arrhythmia types appear on the Arrhythmia Alarms panel.

- **Extended**

  All Arrhythmia types appear on the Arrhythmia Alarms panel.

The following Arrhythmia types are monitored in the Basic Arrhythmia set:

- **Asystole**

  This alarm is activated when no QRS complex is detected within five seconds. When an Asystole alarm is detected, it overrides any existing Pause alarm.

- **VFib (Ventricular Fibrillation)**

  Ventricular fibrillation is characterized by chaotic, uncoordinated ventricular depolarization. The alarm is activated when a pseudo-sinusiodal shape waveform with a frequency of 2-10 Hz is present for at least four consecutive seconds.

- **V-Tach (Ventricular Tachycardia)**

  Ventricular tachycardia is characterized by a sequence of consecutive ventricular beats with a coupling interval of less than 600 ms. You can define the number of consecutive ventricular beats which, if exceeded, activates the alarm (range: 5-12). When a VTach alarm is detected, it overrides any existing Run alarm.

Note: *The V-Tach alarm, does not fail when QRS morphology is "Ventricular"*

Note: *The alarm is activated within 1 second after the selected number of ventricular beats.*

Note: *Asystole, Vfib, and Vtach have the clinical priority of C1 and cannot be disabled when arrhythmia is activated.*

- **Runs**

  This alarm is activated when the consecutive number of Premature Ventricular Contraction (PVC) beats exceeds defined limit (range: 2-12).

- **PVC**

  This alarm is activated when the number of PVCs in a minute exceeds defined limit (range: 1-15).

- **Pause**

  This alarm is activated if no QRS is detected for a defined period of time (range: 1-3 seconds). The alarm stays on for one minute.

In addition to the basic Arrhythmia types, the following Arrhythmia types are monitored in the Extended Arrhythmia set.

- **Bigeminy (BGM)**

  Bigeminy is indicated when every other heart beat is a PVC (N-V-N-V-N-V...). You can define the number of consecutive N-V sequences that activates the alarm.

- **Bradycardia**

  This alarm is activated when the monitored heart rate falls below 50 BPM.

- **Sinus Tachycardia**

  This alarm is activated when the monitored heart rate exceeds 100 BPM.

- **SV Irregular Rhythm**

  This alarm is activated when the rhythm for the last seven normal ventricular QRS complexes is irregularly irregular. This irregular rhythm is generally

caused by atrial fibrillation but it can also be triggered by random premature atrial or nodal beats.

- **Idioventricular Rhythm**

  This alarm is activated when the regular rhythm of at least four ventricular QRS complexes is wider than 120 ms and the RR interval is longer than 1250 ms.

- **Couplets of PVCs**

  This alarm is activated when two PVCs in sequence (N-V-V-N-N) are detected.

- **Triplets of PVCs**

  This alarm is activated when three PVCs in sequence (N-N-V-V-V-N-N) are detected.

- **Trigeminy**

  This alarm is activated when every third beat in a sequence (N-N-V-N-N-V-N-N) is a PVC.

- **R On T**

  This alarm is activated when a PVC falls on or near the T wave of the preceding beat.

- **Premature Atrial Contraction**

  This alarm is activated when a normal QRS ventricular complex from an abnormal atrial focus emerges earlier than the prevailing RR interval.

- **Supraventricular Tachycardia**

  This alarm is activated when a sequence of at least four normal supraventricular QRS complexes with a rate greater than 120 BPM is detected.

- **Multi-Focal PVCs**

  This alarm is activated when PVCs originating from more than one site with different wide QRS shapes are detected.

- **Interpolated PVCs**

  This alarm is activated when at least five PVCs occur, each between two normal beats, without changing the N-N interval.

Monitoring Procedures

The **Arrhythmia** menu provides access to the specific dialog panels that control all aspects of Arrhythmia monitoring. Following is a short description of the panels in the order they appear on the **Arrhythmia** menu:

- **Arrhythmia Alarms**

  This panel displays the current status of the individual Arrhythmia alarms. Use it to activate/deactivate all or individual alarms, set alarm responses for all or individual alarms and, in certain cases, set alarm limits and define where you want alarm data to appear on the main screen display. See “Activating and Setting Alarms” on page 15-5.

- **Activate**

  Use this panel to activate or deactivate Arrhythmia monitoring. See “Activating Arrhythmia Monitoring” on page 15-9.

Accessing the Arrhythmia Menu

The **Arrhythmia** menu can be accessed from the front panel or from the main screen display.

➤ ***To access the Arrhythmia menu from the Main menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu appears.
2. From the **Vital Signs** menu, select **ECG** and then select **Arrhythmia**. The **Arrhythmia** menu appears.

➤ ***To access the Arrhythmia menu from the main screen display:***

- Turn the QuicKnob™ until the **ARR** parameter key is highlighted and press. The **Arrhythmia** menu is displayed.

Activating and Setting Alarms

You can activate and set alarm responses for all or individual Arrhythmia alarms. In some cases, you can also set alarm limits and specify where you want Arrhythmia data to be displayed on the main screen.

The Arrhythmia Alarms dialog panel contains “buttons” that display the current status of the individual Arrhythmia alarms.

Note: *If your system is configured to monitor basic Arrhythmias, only those Arrhythmia types included in the basic Arrhythmia set appear on the Arrhythmia Alarms dialog panel. If your system is configured to monitor extended Arrhythmias, all the Arrhythmia types appear.*

A green checkbox to the left of an Arrhythmia alarm name indicates that the alarm is activated. A green checkbox to the left of an alarm response (record or tone) indicates that it is activated. In cases where alarm limits are user-defined, the panel also presents the currently monitored value and alarm limit.

➤ ***To activate and set all Arrhythmia alarms:***

1. From the **Arrhythmia** menu
   –or–
   if you are already in the Arrhythmia **Activate** panel, from the drop-down list below the title area, select **Arrhythmia Alarms**. The **Arrhythmia Alarms** dialog panel opens.

Alarm and alarm response keys for all arrhythmias are located in the top right corner of the arrhythmia alarm panel.

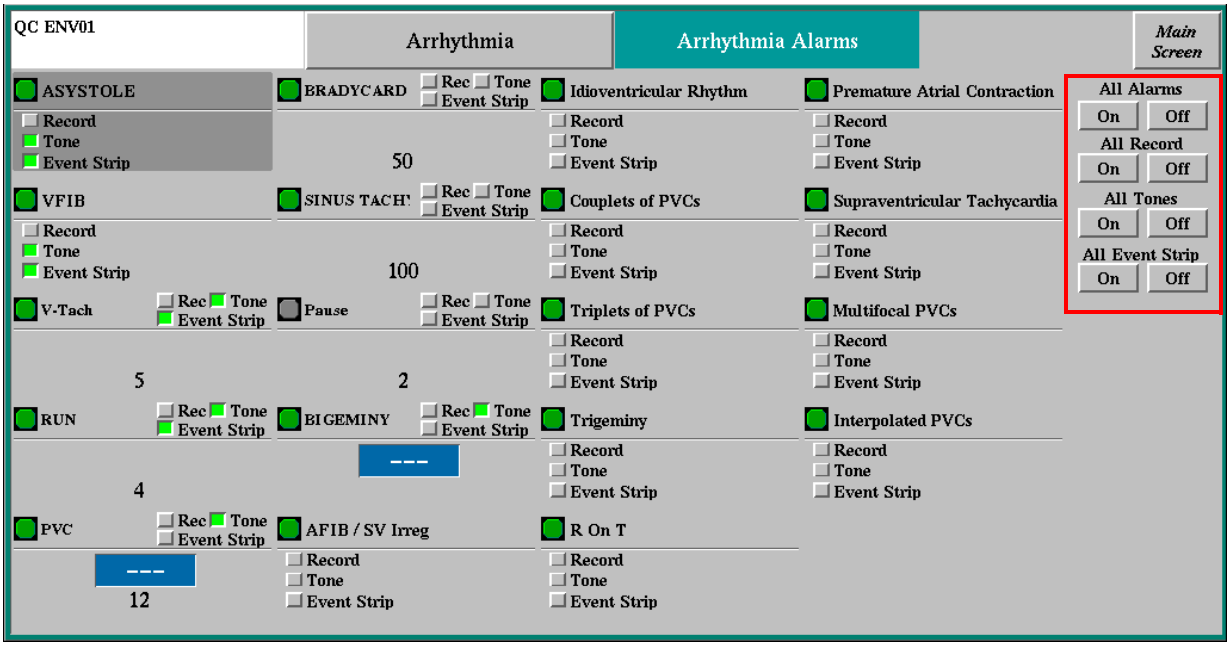


Figure 15-1: The Arrhythmia Alarms Dialog Panel

2. Click the **ON** or **OFF All Alarm** button to set all arrhythmias alarms on or off.
3. Click the **ON** or **OFF All Record** button to set the recording response to arrhythmias alarms to on or off.
4. Click the **ON** or **OFF All Tone** button to set the tone response to arrhythmias alarms to on or off.
5. Click the **ON** or **OFF All Event Strip** button to set the Event Strip alarm response to arrhythmias alarms to on or off.

Note: *Setting **All Alarms** to OFF or ON turns **all** the arrhythmia boxes off or on. Individual arrhythmias can then be set by activating the individual arrhythmia checkbox. See below.*

Note: *When Arrhythmia is activated, Asystole, VFib and Vtach are always ON and have always Tone as an alarm response. Only Record and Event Strip response can be set to OFF.*

Activating and Setting Individual Arrhythmia Alarms

The Menntor X7 enables you to activate and set alarm responses for individual Arrhythmia alarms.

Alarm limits can also be set for the following Arrhythmia alarms: V-Tach (Ventricular Tachycardia), Runs, PVC, Pause and BGM (Bigeminy).

Finally, the area on the main screen display where you want data to appear can be defined for the following Arrhythmia alarms: Runs, PVC and BGM.

There are several types of dialog panels:

- Dialog panel in which you can set alarm responses:
  Life threatening Arrhythmias : Asystole, VFib and Vtach. These arrhymias are always active when Arrhythmia is ON. Their control panel allows to set alarm response to Record or Event Strip. Tone response is always on.

  Figure 15-2 shows the Alarm Response panel for Asystole.

Figure 15-2: Individual Alarm Dialog Panel

- Dialog panel in which you can activate the alarm and set alarm responses and alarm limits:

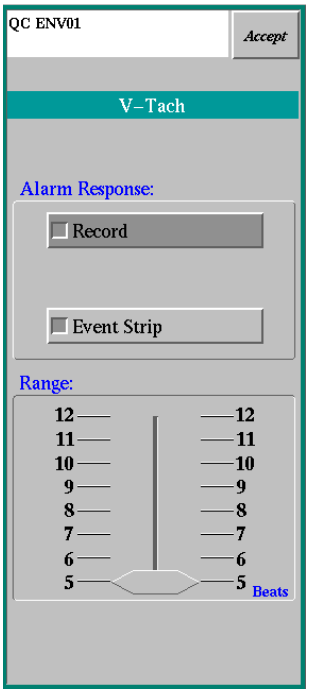


Figure 15-3: Alarm Limit Setting Panel

- Dialog panel in which you can activate the alarm, set alarm responses and alarm limits and define where you want the Arrhythmia data to appear on the main screen display

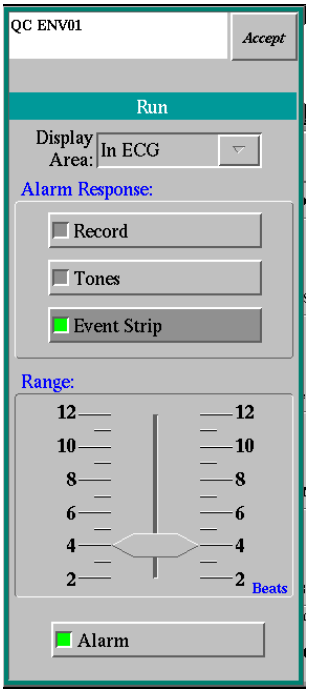


Figure 15-4: Individual Alarm Dialog Panel

➤ ***To activate and set individual Arrhythmia alarms:***

1. From the **Arrhythmia** menu
   –or–
   if you are already in the Arrhythmia **Activate** panel, from the drop-down list below the title area, select **Arrhythmia Alarms**.

   The **Arrhythmia Alarms** dialog panel opens.
2. Select an individual Arrhythmia panel
   –or–
   if you are already in an Arrhythmia dialog panel, from the drop-down list below the title area, select an Arrhythmia type to open the corresponding dialog panel.
3. Select the **Record** checkbox to activate or deactivate recording of the patient's ECG during the alarm.
4. Select the **Tones** checkbox to activate or deactivate the audible alarm.
5. Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.
6. Select the **Alarm** checkbox to activate or deactivate the alarm.

7. Press **Accept** to return to the **Arrhythmia Alarms** dialog panel.
8. When alarm limits are user-defined, use the QuicKnob™ to move the slide indicator on the slider bar to set the required limit.
9. When the main screen display area is user-defined, select the area where you want data to appear from the **Display Area** drop-down list.
10. Select the **Alarm** checkbox to activate or deactivate alarms. The default option is activated.
11. Press **Accept** to save the new settings and return to the **Arrhythmia Alarms** dialog panel.

Activating Arrhythmia Monitoring

Use the **Activate** panel to activate or deactivate Arrhythmia monitoring.

➤ ***To activate or deactivate Arrhythmia monitoring:***

1. From the **Arrhythmia** menu
   –or–
   if you are already in another Arrhythmia panel, from the drop-down list below the title area, select **Activate**.
2. Select the **Activate** checkbox to activate or deactivate Arrhythmia monitoring. By default, Arrhythmia monitoring is activated.
3. Press **ECG** to close the panel and return to the ECG menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

CHAPTER 16:
ST SEGMENT ANALYSIS

ST segment characteristics are indicators of heart muscle ischemia and infarction. The level of the ST segments with respect to the isoelectric baseline and the orientation of the ST segments are of special interest to physicians because they indicate the severity and location of ischemia and infarcts caused by heart disease.

The Menntor X7 bedside monitor provides continuous ST segment analysis. The ST algorithm is applied to dominant, normal beats as determined by the ECG Analysis algorithm. ST values for normal beats are measured and averaged over 30 seconds to reduce the effects of artifact.

The ST algorithm also permits manual adjustment of the ISO and ST measuring points and determines deviations in ST values from a manually set baseline.

If space is available, the viations in ST values from a manually set baseline.

If space is available, the viations in ST values from a manually set baseline.

If space is available, the Menntor X7 plays the ST value for each monitored ECG lead in the Primary area of the main screen display. Availability of space depends on how much space on the main screen display is allocated to displaying ECG data and whether or not Arrhythmia monitoring is activated.

Figure 16-1: Main Screen Display of ST Values for Monitored ECG Leads

ST data can be reviewed with other parameter data in Trends and Charts.

Note: *To enable accurate measurement of the ST segment, ST analysis requires that the ST filter be implemented to provide an expanded ECG bandwidth. Due to the expanded bandwidth, some increase in artifact may be noticed. Proper skin preparation and electrode technique will minimize artifact levels. See "Patient Preparation" on page 16-2.*

Monitoring Procedures

ST parameters are measured from the ECG signal. The **ST** menu provides access to all the specific dialog panels that control all aspects of ST monitoring. Following is a short description of each panel in the order they appear on the **ST** menu:

- Activate

  Use this panel to activate or deactivate ST monitoring. See “Activating ST Monitoring” on page 16-3.

- Alarm Setup

  Use this panel to set ST alarm limits. See “Setting ST Alarm Limits” on page 16-3.

- Alarm Response

Use this panel to define how the viations in ST values from a manually set baseline.

If space is available, the viations in ST values from a manually set baseline.

If space is available, the viations in ST values from a manually set baseline.

If space is available, the viations in ST values from a manually set baseline.

  If space is available, the Menntor X7 responds to detected ST deviations. See “Setting ST Alarm Responses” on page 16-5.

- Display Options

  Use this panel to configure the way ST values are displayed on the main screen. See “Setting Display Options” on page 16-6.

- ST Adjustment

  Use this panel to manually change the ST and ISO measuring points. See “Manually Determining the ISO an ST Measuring Points” on page 16-7.

- ST Variation

  Use this panel to define the baseline from which variation in ST values is derived. See “Determining ST Variations” on page 16-8.

Accessing the ST Menu

The ST menu can be accessed from the front panel, or from the main screen display.

➤ ***To access the ST menu from the Main menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu appears.
2. From the **Vital Signs** menu, select **ECG** and then select **ST**. The **ST** menu appears.

➤ ***To access the ST menu from the main screen display:***

Turn the QuicKnob™ until the **ST** parameter key (if available) is highlighted and press. The **ST** menu is displayed.

Activating ST Monitoring

Use the **Activate** panel to activate or deactivate ST monitoring.

➤ ***To activate or deactivate ST monitoring:***

1. From the **ST** menu
   –or–
   if you are already in another ST panel, from the drop-down list below the title area, select **Activate**.
2. Select the **Activate** checkbox to activate or deactivate ST monitoring.
   By default, ST monitoring is activated.

   Note:*The checkbox appears green when activated and gray when deactivated.*
3. Press **ECG** to close the panel and return to the ECG menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting ST Alarms

ST alarm parameters are set in two dialog panels, **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of ST alarms.

Setting ST Alarm Limits

Use the **Alarm Limits** panel to activate/deactivate ST alarms and set high and low alarm limits. Selecting an ECG lead in the Select Type box activates the corresponding panel containing the current high and low alarm limits as well as the currently measured value for the selected lead.

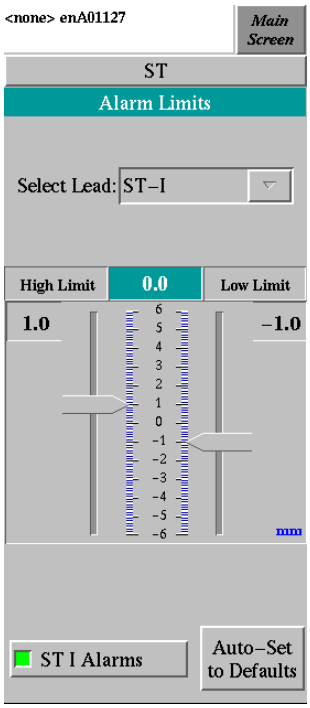


Figure 16-2: The ST Alarm Setup Panel

➤ ***To set ST alarms:***

1. From the **ST** menu
   –or–
   if you are already in another **ST** panel, from the drop-down list below the panel title area, select **Alarm Limits**.
2. From the **Select Lead** drop-down list, select an ECG lead or select **All Leads** to bring up the corresponding panel.
3. Using the QuicKnob™, move the slide indicator on the high limit slider bar along the alarm limits scale to set the required high limit and move the slide indicator on the low limit slider bar to set the required low limit.
   –or–
   Press **Auto-Set to Defaults** to set the ST alarm limits to their default values.
4. Press **ST Alarms** to set alarm limits and activate or deactivate all ST alarms.

   Note:*Checkboxes appear green when activated and gray when deactivated.*
5. Press **ECG** to close the panel and return to the **ECG** menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting ST Alarm Responses

The **Alarm Response** panel controls how the Menntor X7 responds to ST alarms.

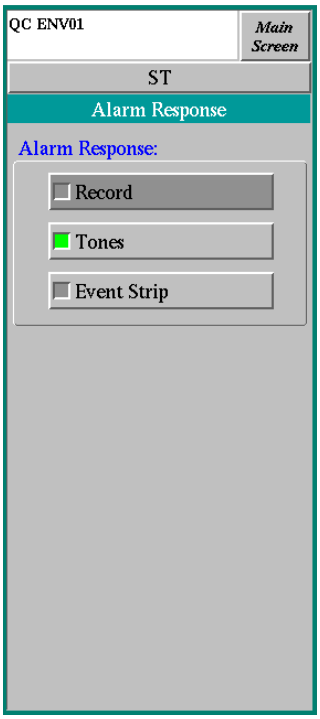


Figure 16-3: The ST Alarm Response Panel

➤ ***To set ST alarm responses:***

1. From the **ST** menu
   –or–
   if you are already in another **ST** panel, from the drop-down list below the panel title area, select **Alarm Response**.
2. Under **Alarm Response**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip upon alarm alarms. By default, Event Strip is deactivated.

Note: *Checkboxes appear green when activated and gray when deactivated.*

3. Press **ECG** to close the panel and return to the **ECG** menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting Display Options

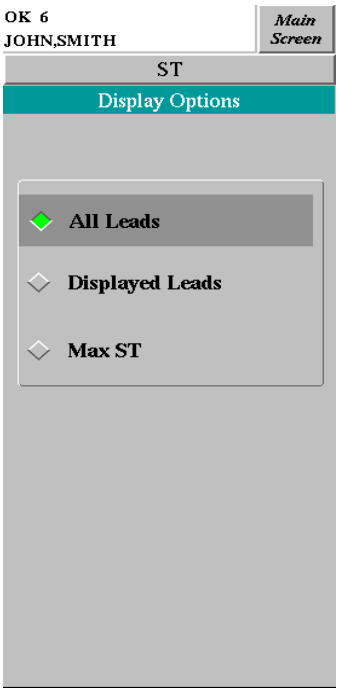


Figure 16-4: The ST Display Options Dialog Panel

Set the Display Option of your choice:

- **All Leads** - Displays ST values for all leads (see Figure 16-1).
- **Displayed Leads** - Shows ST values only for displayed leads.
- **Max ST** - Shows maximum ST value and the lead for which the value was obtained.

Manually Determining the ISO an ST Measuring Points

When a patient is admitted, the ST algorithm automatically determines the ISO and ST measuring points for measuring ST segments. These measuring points may be manually adjusted in the **ST Adjustment** panel.

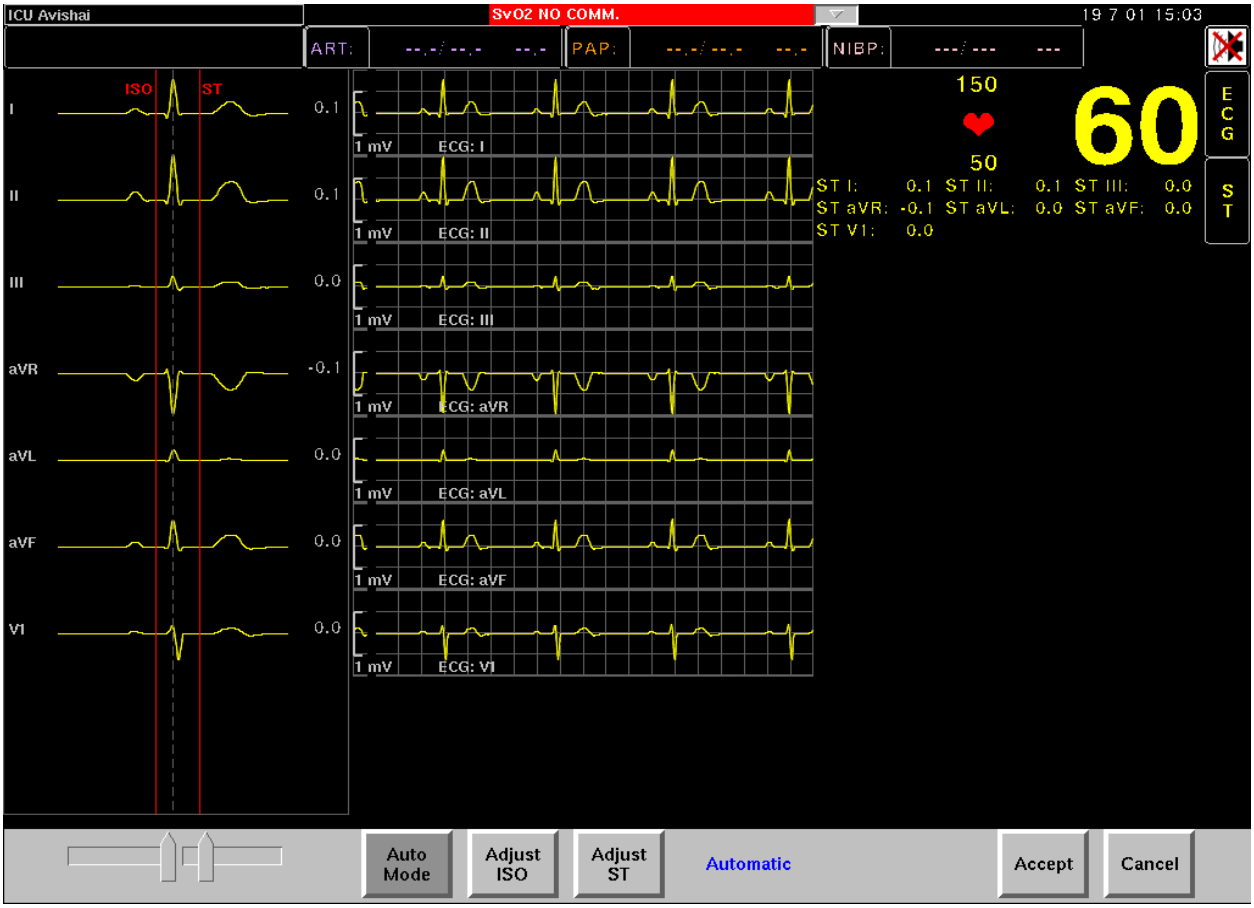


Figure 16-5: The ST Adjustment Panel

The **ST Adjustment** panel includes a waveform area in which the waveform activity of each monitored ECG lead is presented and an adjacent area in which a QRS complex for each monitored ECG lead is presented. Each QRS complex is centered on its “R” point. The ISO and ST measuring points, represented by two red cursors, are defined in terms of the “R” point.

The currently active operating mode is indicated on the toolbar. If manual mode is active, “ST MAN” appears under the ST values in the Secondary Vital Signs area of the main screen display.

➤ ***To determine the ISO and ST measuring points:***

1. From the **ST** menu
   –or–
   if you are already in another **ST** panel, from the drop-down list below the panel title area, select **ST Adjustment**.
2. To select the automatic operating mode, press **Auto Mode**.
3. To adjust the current ISO measuring point, press **Adjust ISO**, use the QuicKnob™ to move the ISO curser to any point within 500 msec to the left of the "R" point and then press **Adjust ISO**.
4. To adjust the current ST measuring point, press **Adjust ST**, use the QuicKnob™ to move the ST curser to any point within 500 msec to the right of the "R" point and then press **Adjust ST**.
5. Press **Accept** to save all changes to the ISO and ST settings, close the **ST Adjustment** panel and return to the main screen display.
6. Press **Cancel** to close the **ST Adjustment** panel without saving changes and return to the main screen display.

Determining ST Variations

When a patient is admitted, the current ST values are automatically displayed in the Secondary Vital Sign area of the main display screen.

The Menntor X7 offers the option to replace the current ST values in the Secondary Vital Sign area with the difference between current ST values and predetermined ST baseline values. It also enables you to set alarms based on these differences.

For example, a patient is admitted with a cardiac condition that has been stabilized at specific ST values. Activating ST Variation enables you to define the specific ST values as the baseline. You can then view variations in the ST values on the main screen display and set alarms based on the baseline values instead of the current ST values.

Note: *If ST Variation is active, "ST VAR" appears under the values displayed in the ST section of the Secondary Vital Signs area on the main screen display.*

ST Variation is activated and baseline values defined in the **ST Variation** panel.

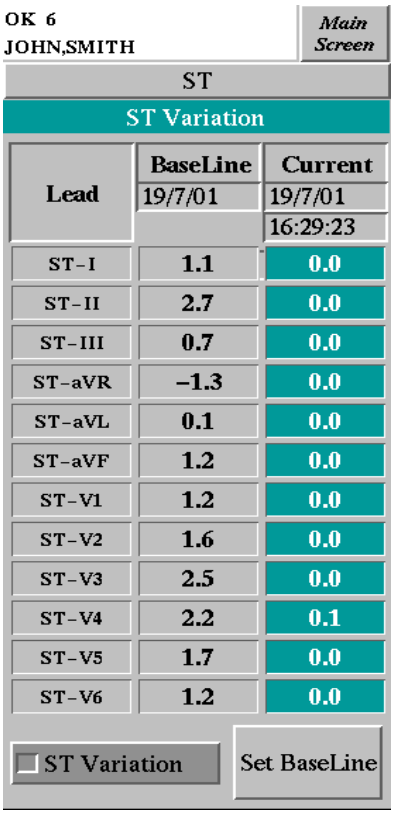


Figure 16-6: The ST Variation Panel

➤ ***To activate ST Variation:***

1. From the **ST** menu
   –or–
   if you are already in another **ST** panel, from the drop-down list below the panel title area, select **ST Variation**.
2. Select the **ST Variation** checkbox to activate or deactivate ST Variation. By default, the checkbox is deactivated.

   Note:*The checkbox appears green when activated and gray when deactivated.*
3. Press **ECG** to close the panel and return to the **ECG** menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

➤ ***To set the ST baseline:***

1. From the **ST** menu
   –or–
   if you are already in another **ST** panel, from the drop-down list below the panel title area, select **ST Variation**.
2. Press **Set BaseLine** to define the current ST values as the baseline values.
3. Press **ECG** to close the panel and return to the ECG menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

CHAPTER 17: RESPIRATION

Overview

Respiration (Resp.) is measured from the ECG electrodes.

The respiration waveform is displayed in the Primary Vital Sign area and represents inspiration and expiration. During inspiration, the thorax moves outward, raising the average impedance. During expiration, the inverse occurs.

The waveform is acquired by impedance pneumography which monitors changes in impedance between two electrodes caused by changes in the bone/tissue/blood ratio between them. An RF reference signal is imposed between the RA and either LA or LL electrodes.

The modulator reference signal for respiration detection is 65 kHz.
The corresponding respiration signal caused by the change in patient impedance is modulated by the 65 kHz. The actual change is small - typically 1 ohm in an average impedance of 1000 ohm. The modulated signal is then amplified and filtered in order to “clean” environmental noise and to derive the respiration rate. The Menntor X7 bedside monitor calculates respiration rate and Breath-by-Breath time intervals. Once every minute, trended data is acquired for storage. This data includes:

- Total number of breaths per minute

Note: *In order to allow Respiration monitoring, ensure that $EtCO_2$ is not activated.*

Patient Preparation

Patient preparatory procedures are the same as for ECG monitoring (See “Patient Preparation” on page 17-2.). For optimal results when monitoring both ECG and respiration, use the electrode positions described in Figure 14-2:Three Lead Electrode Placement, in Figure 14-3:Five Lead Electrode Placement and in Figure 14-4:Three Lead Neonatal Electrode Placement.

Note: *Proper electrode placement is critical when monitoring respiration. The slight loosening of an active electrode may be acceptable for ECG monitoring, but it will cause a Respiration fault. If this occurs, re-attach LA and RA (or RA and LL) electrodes.*

Monitoring Procedures

Respiration monitoring is set up through the Respiration menu dialog panels. Each dialog panel enables control of different aspects of Resp monitoring. The available panels are:

- **Lead/Gain**

  Use this panel to select the required lead and gain for monitoring respiration. See “Setting Respiration Leads and Gain” on page 17-3.

- **Alarm Limits**

  Use this panel to set respiration alarm limits and criteria. See “Setting Resp Alarm Limits” on page 17-4.

- **Alarm Response**

  Use this panel to define the way the Menntor X7 responds to respiration alarm events. See “Setting the Respiration Alarm Response” on page 17-6.

- **Display Options**

  Use this panel to configure the way respiration parameters are displayed on the main screen. See “Setting Resp Display Options” on page 17-8.

- **Heart Rate Coincidence**

  Use this panel to set parameters defining the detection and response to Heart Rate Coincidence alarms. See “Setting the Heart Rate Coincidence Alarm” on page 17-10.

- **Activate**

  Use this panel to activate or deactivate respiration monitoring. See “Activating and Deactivating Respiration Monitoring” on page 17-12.

All the above panels can be accessed from the **Resp** menu.

Accessing the Respiraion (RSP) Menu

There are two ways to access the **Resp** menu:

- From the **Vital Signs** menu
- From the main screen display

➤ ***To access the Resp menu from the Vital Signs menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu appears.
2. From the **Vital Signs** menu, select **RSP**. The **RSP** menu is displayed.

➤ ***To access the Resp menu from the main screen display:***

- Turn the QuicKnob™ until the **RSP** parameter key (or value if Resp is displayed as a secondary vital sign or as a big number) is highlighted and press to display the **RSP** menu.

Setting Respiration Leads and Gain

Select the required lead and gain for monitoring respiration in the **Lead/Gain** dialog panel:

- Lead Selection - select RA-LL or RA-LA.
- Gain Control - select either Automatic Gain Control (AGC), or 1/8, 1/4, 1/2, 1, 2, 4, or 8.

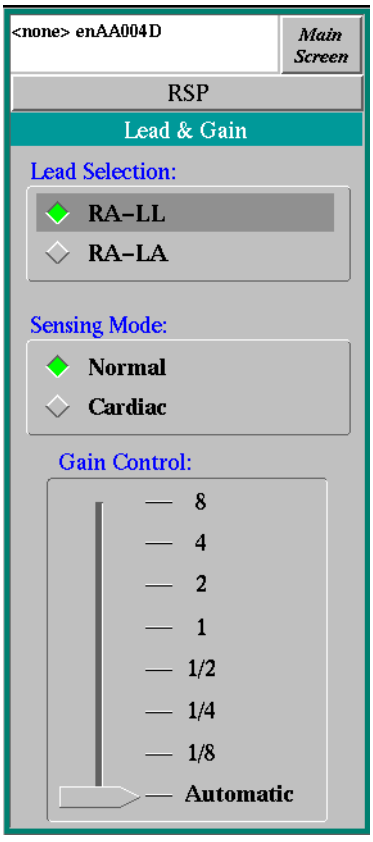


Figure 17-1: The Respiration Lead/Gain Dialog Panel

➤ ***To set respiration leads and gain:***

1. From the **Respiration** menu
   –or–
   if you are already in another **Respiration** dialog panel, from the drop-down menu list below the **Respiration** title area, select **Lead/Gain**.
2. Select either **RA-LL** or **RA-LA**, as required. Only one option can be selected.
3. Set the slider bar on the scale to the required gain. The available options are: **Automatic**, **1/8**, **1/4**, **1/2**, **1**, **2**, **4**, or **8**. Automatic Gain Control (AGC) sets the range of the displayed waveform. AGC response time is 10 seconds for adults and 5 seconds for pediatric or neonatal patients.
4. If the respiration waveform shows cardiac pulses, click **Cardiac** to toggle between activating algorithm and eliminating detection of cardiac pulses.
5. Press **RSP** to return to the **RSP** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Setting Respiration Alarms

Respiration alarm parameters are set in two dialog panels, **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of **Resp** alarms.

Setting Resp Alarm Limits

The **Alarm Limits** dialog panel enables you to set respiration alarm limits and criteria. Two types of alarms are monitored:

- **Respiration Rate** - Respiration is monitored by impedence pneumography which monitors respiratory effort as reflected by chest or abdominal wall motion. The monitor checks that the respiration rate value is within a specific range (between 0-150 BPM). Any respiration rate outside of the allowed limits triggers an alarm.
- **Apnea** - Apnea is the absence of detected breathing for a defined period of time. Impedence pneumography counts breaths by counting cycles of impedence change (one cycle equals one breath). Whenever the number of breaths defined in System Configuration is detected, an apnea timer is reset. If no breath is detected, an apnea alarm is triggered after a pre-defined time limit runs out.

The currently monitored respiratory rate appears on the panel.

By configuring the parameters on this panel you can:

- Activate or deactivate all respiratory alarms.
- Set low and high respiratory rate alarm limits ranging from 0 -150 BPM.
- Set an apnea duration after which the apnea alarm is triggered.
  Options are 10, 15, 20, 30 and 45 seconds. Default duration is 20 seconds.
- Set high and low respiratory alarms to default values.

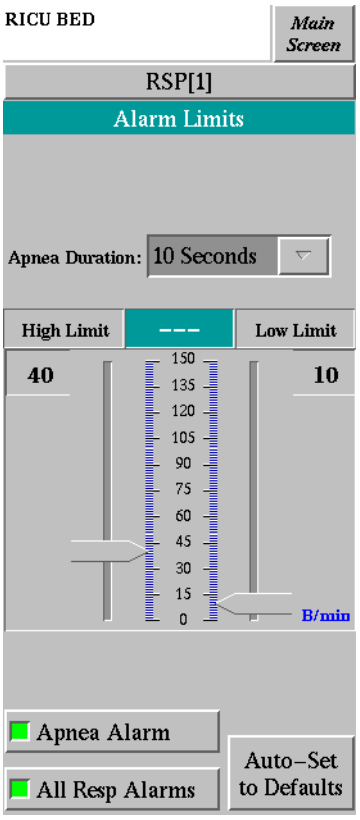


Figure 17-2: The Respiration Alarm Limits Dialog Panel

➤ ***To set alarm limits parameters:***

1. From the **Respiration** menu
   –or–
   if you are already in another Respiration dialog panel, from the drop-down menu list below the **Respiration** title area, select **Alarm Limits**.
2. Select the **Enable Alarm** checkboxes located below the scales for High and Low Apnea alarm limits to activate or deactivate the respective sliders.

3. Turn the QuicKnob™ until the low alarm limit scale is highlighted and press. Turn the QuicKnob™ to the required alarm limit and press. Repeat the procedure for the high alarm limit. The range for each limit is 0-150 BPM. When the QuicKnob™ is not pressed while turned, it increases or decreases the limit in units of 5 BPM. When the QuicKnob™ is pressed while being turned, it increases or decreases the limit one BPM at a time
   –or–
   Select **Auto Set to Defaults** to set high and low alarm limits to default values.
4. Select the **All Resp Alarms** checkbox to activate or deactivate **Resp** alarm detection. When deactivated, the sliders for setting alarm limits are disabled.
5. Press **RSP** to return to the **RSP** menu
   –or–
   Press **Main Screen** to return to the main screen display.

Setting the Respiration Alarm Response

Define the way the Menntor X7 visually and audibly responds to respiration alarms in the Resp **Alarm Response** dialog panel. Default response values are set in System Configuration.

By configuring the parameters on this panel you can :

- Define whether visual alarm messages, audible alarm tones or both signal a triggered alarm.
- Activate recording of the patient’s respiration waveform when an alarm is detected.

CAUTION! *The recorder paper speed is fixed on 25 mm/Sec and is not related to the sweep speed setting for ECG or respiration waveforms. The respiration waveform will thus look*

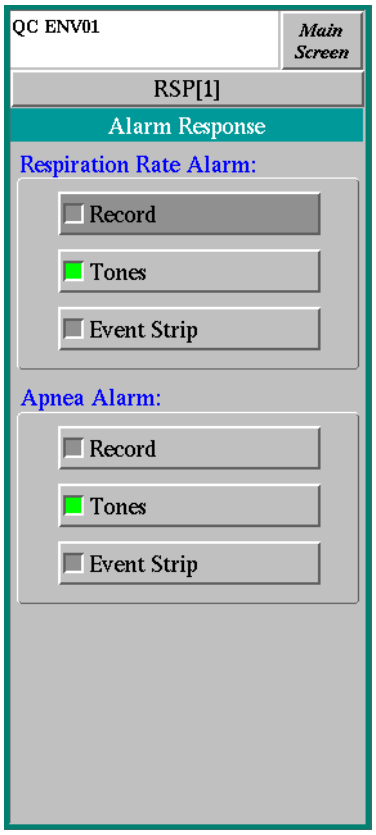


Figure 17-3: The Respiration Alarm Response Dialog Panel

➤ ***To set respiration alarm responses:***

1. From the **Respiration** menu
   –or–
   if you are already in another respiration dialog panel, from the drop-down list below the title area, select **Alarm Response**. The **Alarm Response** dialog panel is displayed.
2. Under **Respiration Rate Alarm**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's ECG during the alarm event.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.

3. Under **Apnea Alarm**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's ECG during the alarm event.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.
4. Press **RSP** to return to the **RSP** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting Resp Display Options

By defining Display Options parameters, the way respiration waveforms and values appear on the main screen display can be changed to suit your hospital's or department's particular needs. Any changes made are immediately reflected on screen.

By setting the parameters on the **Display Options** dialog panel you can :

- Instruct the monitor to display respiration either as a waveform in the Primary Vital Sign area, as a Secondary Vital Sign or in "Big Number" format on screen.
- Set the waveform on a 5x5 mm grid.
- Define the color of respiration waveforms and values as they are displayed on screen. All respiration waveforms and values have the same color unless they go into alarm, in which case the value takes on the alarm priority color. When the alarm condition passes, the original color is restored.
- Configure the following values to be displayed or not, as required: Respiration Rate, High/Low Rate Limits, selected Lead, Status messages, Apnea alarm limit and last Apnea event. When Resp appears in the Primary Vital Sign area, all of the above items can fit into the standard display area.
- Set the Sweep Speed.

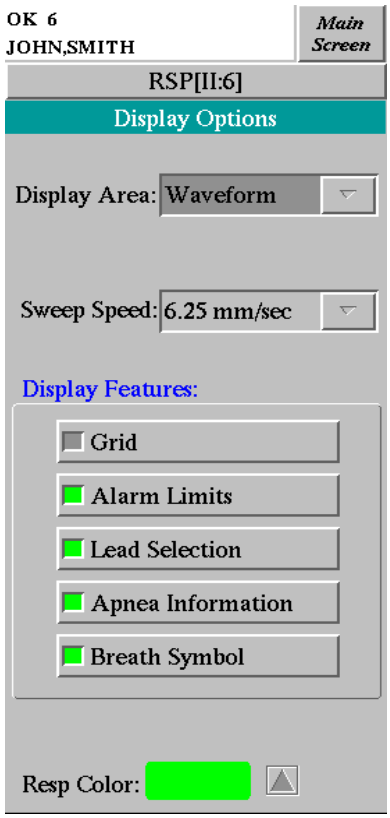


Figure 17-4: The Respiration Display Options Dialog Panel

➤ ***To set display options:***

1. From the **Respiration** menu
   –or–
   if you are already in another Respiration dialog panel, from the drop-down list below the title area, select **Display Options**. The **Display Option**s dialog panel is displayed.
2. From the **Display Area** drop-down list, select the area where you want Resp to be displayed on screen. The options are: **Waveform**, **Secondary VS area**, and **Big Numbers**. The default is **Waveform**.
3. From the **Sweep Speed** drop-down list, select the required sweep speed. Options are **ECG Sweep Speed**, **6.25 mm/sec**., and **12.5 mm/sec**.

4. Under **Display Features**:
   - Select the **Grid** checkbox to activate or deactivate display of a grid. By default, this option is deactivated and is available only when Respiration is displayed in the Primary Vital Sign area as a waveform.
   - Select the **Alarm limits** checkbox to activate or deactivate display of this value on screen.
   - Select the **Lead Selection** checkbox to activate or deactivate display of this value on screen.
   - Select the **Apnea Information** checkbox to activate or deactivate display of this value on screen.
   - Select the **Breath Symbol** checkbox to activate or deactivate display of this value on screen.
5. Select **Resp Colors**, and select the color required for Resp parameters from the panel that appears. You can choose from 16 colors. The default color is green.
6. Press **RSP** to return to the **RSP** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting the Heart Rate Coincidence Alarm

When ECG/RSP electrodes are positioned to enhance respiratory monitoring or the patient's breathing signal is slight or non-existant, the Menntor X7 may count cardiogenic waveforms as respirations due to Cardiavascular artifact (CVA). This happens because AGC sensitivity increases as the respiration signal decreases. The Menntor X7 compares heart and Resp rate values looking for similarities over a period of time. A Heart Rate Coincidence alarm is triggered if the respiration rate value remains within 7% of the heart rate for eight consecutive seconds.

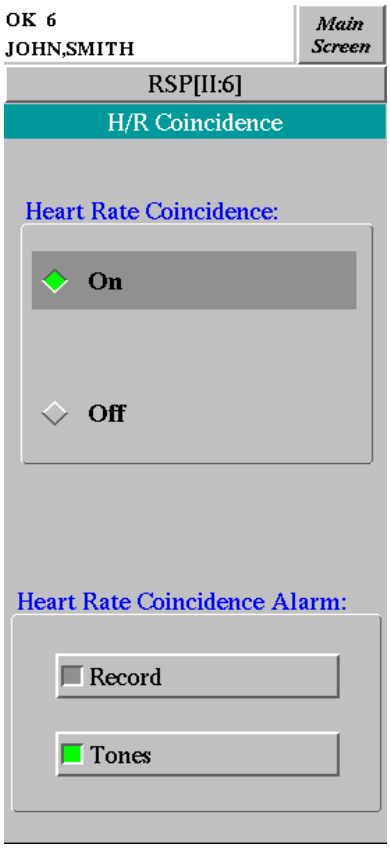


Figure 17-5: The Respiration Heart Rate Coincidence Dialog Panel

➤ ***To set the heart rate coincidence alarm:***

1. From the **Respiration** menu
   –or–
   if you are already in another Respiration dialog panel, from the drop-down list below the title area, select **H/R Coincidence**. The panel is displayed.
2. Select **On**" or "**Off** to activate or deactivate monitoring of Heart Rate Coincidence.
3. Select the **Record** checkbox to activate or deactivate recording of the patient's respiration waveform during an alarm event.
4. Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
5. Press **RSP** to return to the **RSP** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Activating and Deactivating Respiration Monitoring

Respiration monitoring can be activated or deactivated in the **Activate** panel. You can also temporarily discontinue monitoring for whatever reason and resume monitoring at a later time.

➤ ***To activate/deactivate respiration monitoring:***

1. From the **Respiration** menu
   –or–
   if you are already in another Respiration dialog panel, from the drop-down list below the title area, select **Activate**. The **Activate** dialog panel is displayed.
2. Select the **Activate** checkbox to activate or deactivate respiration monitoring.
3. Press **RSP** to return to the **RSP** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

CHAPTER 18:
INVASIVE BLOOD PRESSURES (BP)

Overview

Invasive blood pressures (BPs) are monitored by the ***Menntor X7*** two (model 6810001x0) or four (model 6810002x0) channels, enabling simultaneous monitoring of two or four invasive BPs..

A BP label is selected for monitoring based on site (the location on the patient's body where the catheter is inserted). Each BP name contains the name of the site (e.g.,CVP or LAP).

BPx	Generic Blood Pressure
ART	Arterial Pressure
AO	Aortic Pressure
PAP	Pulmonary Arterial Pressure
CVP	Central Venous Pressure
RAP	Right Atrial Pressure
LAP	Left Atrial Pressure
ICP	IntraCranial Pressure
CPP	Cerebral Perfusion Pressure

BP waveforms are filtered to “clean” environmental noise (12 Hz low pass filters). BP rates are calculated and displayed in mmHg units. Systolic, diastolic and mean values are calculated for each BP channel every second and are included in the beat-by-beat data for each heartbeat. Once a minute, the Menntor X7 ***Series*** collects trended data (including the minimum, maximum and mean BP values) for each monitored BP channel.

The Menntor X7 checks the cables and transducers. If a cable or a transducer is not properly plugged in or if a transducer is short-circuited, a technical priority alarm is displayed.

When an alarm on a monitored BP is detected, the normal display color for the values of that BP changes to the alarm priority display color. When the alarm condition passes, normal display color is restored.

The Menntor X7 also enables you to monitor Left Atrium BP by using the Wedge Pressure procedure. A Swan-Ganz™ catheter is inserted into a central vein and the distal end of the catheter is situated in the pulmonary artery. After the balloon lumen surrounding the distal end is inflated, the Menntor X7 automatically calculates the Pulmonary Capillary Wedge Pressure (PCWP) value and then permits you to modify the derived value. The final PCWP value is equal to the Left Atrium BP.

Similar procedures are provided for measurement of PAP and CVP from the same transducer by rotating the stopcock of the Swan-Ganz catheter, between the catheter's distal (for PAP) or proximal (for CVP) ends.

Caution

Mennen Medical does not manufacture pressure transducers.

See Appendix A for Mennen Medical recommended transducers and accessories (Appendix A: “Accessories” on page A-1.).

Other pressure transducers and accessories may be used for invasive blood pressure measurement, however, they must comply with IEC 60601-2-34 standard.

Warnings

- Do not re-use disposable devices.
- Transducers or accessories which are supplied as sterile must by identified as sterile.
- The operator must avoid conductive connection to applied parts (parts which come in contact with the patient, such as metal cocks) which could degrade the electrical safety of the system.

Preparatory Checklist

- ☐ Insert the pressure cable into the input.
- ☐ Prepare the pressure line and transducer using your routing hospital procedure. Make sure that there are no air bubbles.
- ☐ Connect the catheter to the pressure line. Make sure that no air is present in either the catheter or the line.
- ☐ Position the transducer correctly in the patient. It should be level with the heart. The correct position depends on the type of pressure line.
- ☐ Zero the transducer. If the transducer is not zeroed, there will be no valid zero value for the instrument to use.
- ☐ Zero the transducer whenever a new transducer is used or as frequently as dictated by hospital policy.

BP Monitoring Procedures

The BP menu provides access to specific dialog panels enabling interaction with all aspects of BP monitoring. Each dialog panel enables control of different aspects of BP monitoring. The available dialog panels are:

- **Zero Pressure**

  Use this panel to zero BP transducers. See “Zeroing BP Transducers” on page 18-4.

- **Scale**

  Use this panel to define the way BP waveforms are scaled for presentation on the main screen display. See “Selecting the BP Scale” on page 18-6.

- **Alarm Limits**

  Use this panel to activate/deactivate BP alarms and set BP alarm limits. See “Setting BP Alarm Limits” on page 18-7.

- **Alarm Response**

  Use this panel to define the way alarms are heard and displayed on the monitor. See “Setting BP Alarm Response” on page 18-9.

- **Display Options**

  Use this panel to define how BP waveforms and values appear on the main screen display. See “Setting BP Display Options” on page 18-11.

- **Activate**

  Use this panel to activate/deactivate BP monitoring, See “Activating and Deactivating BP Monitoring” on page 18-16.

- **PCWP from PA**

  Use this panel to derive the PCWP value . See “Deriving the PCWP Value” on page 18-13. This key is dimmed if PAP is not zeroed.

- **CVP from PA**

  Use this panel to intermittently measure CVP from the BP channel reserved for PAP. See “Measuring the Central Venous Pressure” on page 18-14.
  This key is dimmed if PAP is not zeroed.

Accessing the BP Menu

The **BP** menu can be accessed from the **Vital Signs** menu or from the main screen display.

➤ ***To access the BP panel from the Vital Signs menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu appears. All BPs currently monitored appear on the **Vital Signs** menu.
2. From the **Vital Signs** menu, select the required BP. The appropriate menu is displayed.

➤ ***To access the BP panel from the main screen display:***

Turn the QuicKnob™ until the appropriate BP parameter key is highlighted and press to access the **BP** panel.

Zeroing BP Transducers

Before the Menntor X7 begins taking BP measurements, you must zero the BP transducers. If the BP transducers are not zeroed, waveform data appears but the BP value is not calculated.

You can zero BP transducers by:

- Pressing one of the Zero buttons on the 2BP and CO/2 TMP to zero the BP transducer connected to the adjacent channel connector.
- Using the **Zero Pressure** dialog panel to zero the transducer for the BP displayed in the menu title or to zero the transducers for all monitored BPs.

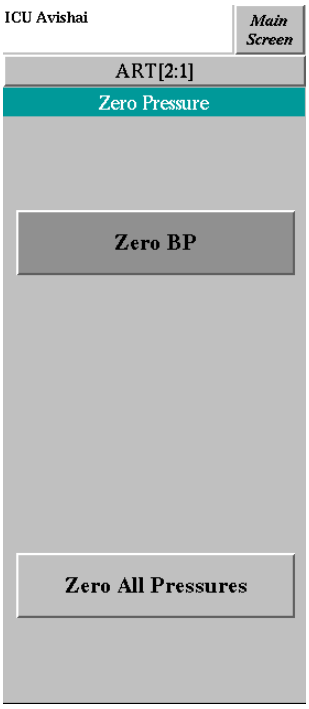


Figure 18-1: The BP Zero Pressure Dialog Panel

➤ ***To zero BP transducers:***

1. From the **BP** menu, select **Zero Pressure**.
2. Open transducer to atmospheric pressure and press **Zero BP** to zero transducers for the currently displayed BP
   –or–
   Open all transducers to atmospheric pressure and press **Zero All Pressures** to zero all monitored BP transducers.
3. Press **BP Site Name** to return to the BP menu
   –or–
   Press **Main Screen** to return to the main screen display.

Selecting the BP Scale

The **Scale** dialog panel defines the way BP waveforms are scaled for presentation on the main screen display. You can configure the Menntor X7 to scale waveforms automatically or you can manually set high and low scale limits. Scale range depends on the monitored BP.

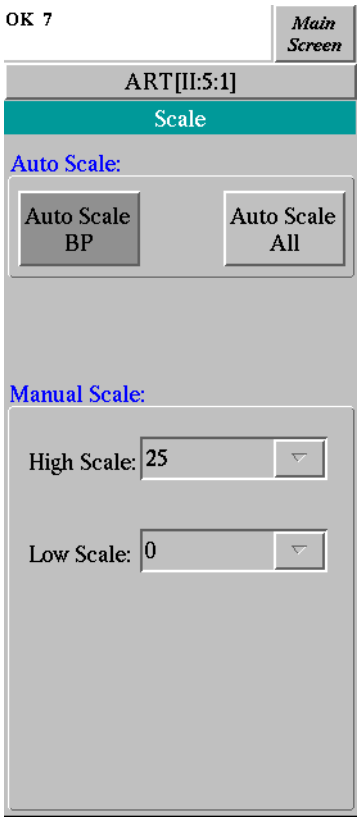


Figure 18-2: The BP Scale Dialog Panel

➤ ***To automatically scale the BP waveform:***

1. From the **BP** menu
   –or–
   from the drop-down menu list below the BP title area in the **BP** panel, select **Scale**.
2. Press **Auto Scale BP** to automatically scale the current BP waveform.
3. Press **Auto Scale All** to automatically scale all BP waveforms.

Note: ***Auto Scale All*** *will not affect scales that were set manually.*

4. Press **BP** to return to the **BP** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

- ***To manually scale the BP waveform:***

1. Select the high and low waveform values from the **High Scale** and **Low Scale** drop-down lists.
2. Press **BP** to return to the **BP** menu.
   –or–
   Press **Main Screen** to return to the main screen display.

Setting BP Alarms

BP alarm parameters are set in two dialog panels: **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of BP alarms.

Setting BP Alarm Limits

The **Alarm Limits** dialog panel controls activation and deactivation of BP alarms and sets BP alarm limits. Low and high alarm limits are set separately for systolic, diastolic and mean values.

Low and high limit alarm detection can be enabled or disabled for each of the BP values (systolic, diastolic and mean) or for all three values.

Alarm limits can automatically be set to the default values set in the System Configuration.

Default limits differ according to BP type. The following table provides a list of BP types and their respective default scale and alarm limits.

BP Name	*Scale*	*Alarm Limits*
ART	0 to 300	Systolic, diastolic and mean - all 10 to 300 mm/Hg
PAP	0 to 150	Systolic, diastolic and mean - all 0 to 200 mm/Hg
CVP	0 to 50	Mean - 0 to 100 mm/Hg
RAP	0 to 50	Mean - 0 to 100 mm/Hg
LAP	0 to 50	Mean - 0 to 100 mm/Hg
ICP	0 to 100	Mean - 0 to 100 mm/Hg
BPx	0 to 300	Systolic, diastolic and mean - all 0 to 300 mm/Hg

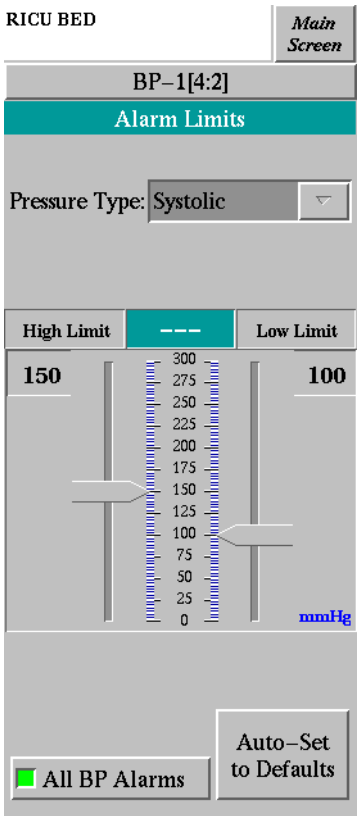


Figure 18-3: The BP Alarm Limits Dialog Panel

➤ ***To set BP alarm limits:***

1. From the **BP** menu
   –or–
   From the drop-down list below the BP title area in the **BP** panel, select **Alarm Limits**.
2. From the **Select Type** drop-down list, select the type of BP for which you wish to set alarm limits.
3. Select the **All BP Alarms** checkbox to activate or deactivate both high and low limit alarms. When deactivated, alarm detection is disabled and the slider is disabled.
4. Using the QuicKnob™, set the left marker on the slider bar to the required high alarm limit for the current BP, then set the right marker to the required low alarm limit. These limits are displayed in the High and Low Limit value areas on the panel.
   –or–

   Press **Auto Set to Defaults** to automatically set alarm limits to default values.

5. Press **BP** to return to the BP menu
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting BP Alarm Response

The **Alarm Response** panel controls the way the Menntor X7 responds to BP alarms. The panel is divided into two areas:

- **BP Alarm Response**, where response preferences are set for clinical alarms
- **BP Fault Response**, where preferences are set for technical alarms.

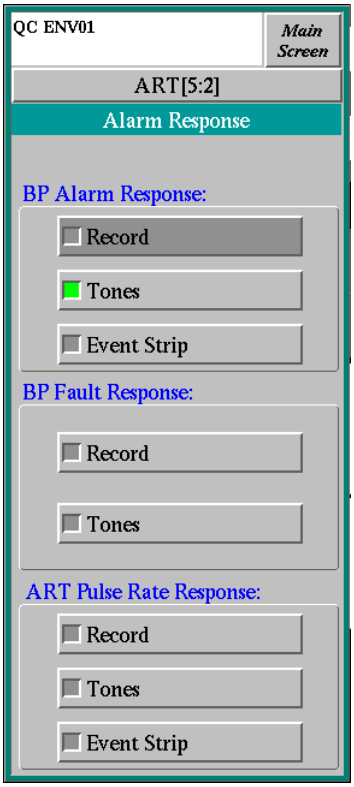


Figure 18-4: The BP Alarm Response Dialog Panel

➤ ***To set alarm response preferences:***

1. From the **BP** menu
   –or–
   from the drop-down menu list below the BP title area in the **BP** panel, select **Alarm Response**. The panel appears immediately.
2. Under **BP Alarm Response**:

- Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
- Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
- Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.

3. Under **BP Fault Response**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
4. Under **ART Pulse Rate Response:**
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is deactivated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.
5. Press **BP** to return to the BP menu
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting BP Display Options

The BP **Display Options** panel controls how BP waveforms and values appear on the main screen display. Use the **Display Options** panel to:

- Determine whether the monitored BP appears on screen as a waveform, in the Secondary Vital Signs area or in Big Number format.
- Define the numeric format for the BP.
- Define whether alarm limits, S/D/M labels, and measurement units appears in the display area.
- Detemine if the pulse rate is displayed (when the monitored BP is ART).
- Determine if wedge pressure, CVP from PAP, or Cardiac Output is displayed (when the monitored BP is PAP).
- Determine if Cerebral Perfusion Pressure (CPP) is displayed (when the monitored BP is ICP).
- Define the color of the vital sign display (including waveform and all other information). The default colors can be changed at any time in this panel. Default display colors are:
  - ART - Pink
  - BP - Light Blue
  - CVP - Orange
  - Others - Grey or Silver

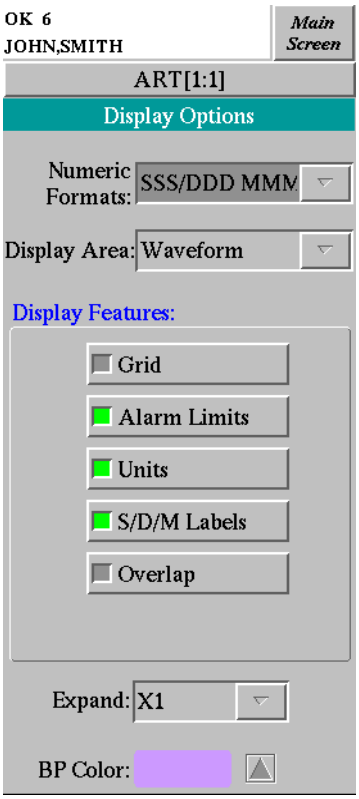


Figure 18-5: BP Display Options Panel

➤ ***To set BP Display Options:***

1. From the **BP** menu
   –or–
   From the drop-down menu list below the title area in the **BP** panel, select **Display Options**.
2. From the **Numeric Formats** drop-down list, select **SSS/DDD MMM**, **SSS/DDD mmm** or **SSS/DDD**. The default for BPx, ART and PAP is **SSS/DDD MMM**. The default for CVP, LAP, RAP and ICP is **MMM**.
3. From the **Display Area** drop-down list, select the area where you want the BP to be displayed on screen. The options are: **Waveform**, **Secondary VS**, and **Big Numbers**. The default is **Waveform**.
4. Under **Display Features**:
   - Select the **Grid** checkbox to activate or deactivate display of the BP waveform on a grid. By default, the checkbox is deactivated. This option is active only if the BP is displayed in the Primary Vital Sign area as a waveform.

- Select the **Alarm Limits**, **S/D/M Labels**, and **Units** checkboxes to activate or deactivate display of these parameters on the main display screen.

5. From the **BP Colors** list, select the color required for BP parameters. You have a choice of 16 colors. The default colors are: ART - Pink, BP - Light Blue, CVP - Orange, Others - Grey or Silver.
6. Press **BP** to return to the BP menu
   –or–
   Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Deriving the PCWP Value

The Menntor X7 enables you to monitor the Left Atrium BP using the Wedge Pressure procedure. The derived Pulmonary Cappillary Wedge Pressure (PCWP) value is equal to the Left Atrium BP.

Note: *The Wedge Pressure procedure is available only after the PAP transducer has been zeroed.*

Each step of the Wedge Pressure procedure is monitored in the PCWP dialog panel. Messages are issued in the upper left hand corner that guide you through the procedure.

During the procedure, the Menntor X7derives the PCWP value by averaging the expiratory and inhalatory values during respiration. You can accept this value or manually change the value to better reflect the average value during expiration.

When the procedure is completed, the Menntor X7enters the PCWP value under Hemodynamics and Vital Signs in the patient's chart.

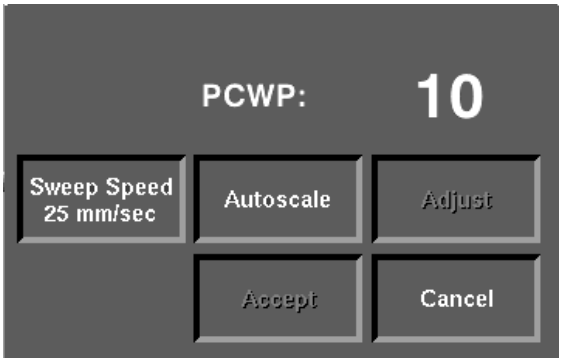


Figure 18-6: The PCWP Dialog Panel

➤ ***To measure the Pulmonary Capillary Wedge Pressure:***

1. Insert the Swan-Ganz catheter into a central vein and properly situate the distal end of the catheter in the pulmonary artery. Do not inflate the balloon.
2. From the **BP** menu
   –or–
   From the drop-down menu list below the BP title area in the **BP** panel, select **PAP** to open the **PAP** menu, select **PCWP from PA** and then select **Start Procedure**. The **PCWP** dialog panel opens and the following message appears in the upper left corner: “Inflate balloon”.
3. To automatically scale the PAP waveform, press **Autoscale**.
4. To simultaneously change the sweep speed of the PAP and RSP waveforms, press **Sweep Speed** and select a different speed from the drop-down list. Available options are 6.25, 12.5, 25 and 50 mm/sec. The default sweep speed is the same as the current ECG sweep speed.
5. Inflate the balloon and wait until the following message appears in the upper left corner of the PCWP dialog panel: “Catheter Wedged”. The Menntor X7 automatically calculates the PCWP value and displays it on the **PCWP** dialog panel.
6. Press **Accept** to accept the PCWP value.
   –or–
   Press **Adjust**. The PAP waveform is frozen and a red cursor marks the location of the PCWP value. Use the QuicKnob™ to move the red cursor up or down. When satisfied, press **Accept**. The **PCWP** dialog panel closes and the PCWP value appears in the PAP area on the main screen display with a date and time stamp.
7. Deflate the balloon.

   Note: *If approximately 20 seconds elapses after inflating the balloon and you have not accepted a PCWP value, the following message appears in the upper left corner of the PCWP dialog panel: “Deflate balloon”. Deflate the balloon immediately to allow blood flow into the lungs. The* Menntor X7 *freezes the PAP waveform at the point the catheter was wedged.*

Measuring the Central Venous Pressure

The Menntor X7 enables you to intermittently measure the Central Venous Pressure (CVP) on a BP channel reserved for measuring Pulmonary Arterial Pressure (PAP) if you are measuring PAP with a Swan-Ganz catheter.

Note: *This method of measuring CVP is available only if no other BP channel is used for measuring CVP.*

The Menntor X7 derives the CVP by averaging the expiratory and inhalatory values during respiration and displays it in the CVP from PA dialog panel. You can accept this value or manually change the value to better reflect the average value during expiration.

The Menntor X7 enters the accepted value under Vital Signs in the patient's chart.

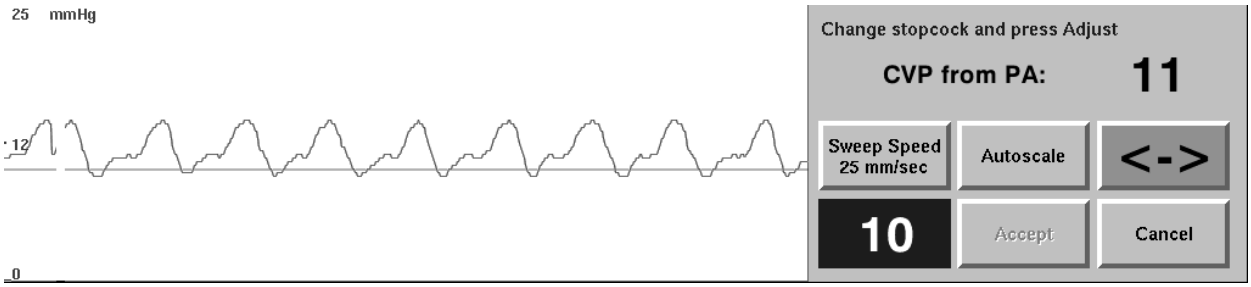


Figure 18-7: PAP Waveform and the CVP From PA Dialog Panel

➤ ***To measure CVP on a BP channel reserved for PAP:***

1. Insert the Swan-Ganz catheter into a central vein and properly situate the proximal end of the catheter in the central vein and the distal end of the catheter in the pulmonary artery.
2. From the **BP** menu
   –or–
   From the drop-down menu list below the BP title area in the **BP** panel, select **PAP** to open the **PAP** menu, select **CVP from PA** and then select **Start Procedure**. The **CVP from PA** dialog panel opens and the following message appears in the upper left corner: "Change stopcock and press Adjust".
3. Rotate the stopcock on the Swan-Ganz to connect the PAP transducer to the proximal end of the catheter. The Menntor X7 automatically calculates the CVP and displays it on the **CVP from PA** dialog panel.
4. Press **Accept** to accept the CVP value.
   –or–
   Press **Adjust**. The PAP waveform is frozen and a red cursor marks the location of the CVP value. Use the QuicKnob™ to move the red cursor up or down. When satisfied, press **Accept**. The **CVP from PA** dialog panel closes and the CVP value appears in the PAP area on the main screen display with a date and time stamp.
5. To automatically scale the CVP waveform, press **Autoscale**.

6. To simultaneously change the sweep speed of the CVP and RSP waveforms, press **Sweep Speed** and select a different speed from the drop-down list. Available options are 6.25, 12.5, 25 and 50 mm/sec. The default sweep speed is the same as the current ECG sweep speed.

Activating and Deactivating BP Monitoring

BP monitoring can be activated and deactivated in this panel. Monitoring can also be discontinued for whatever reason and resumed later.

➤ ***To activate and deactivate BP monitoring:***

1. From the **BP** menu
   –or–
   From the drop-down menu list below the BP title area in the **BP** panel, select **Activate**. The BP **Activate** panel is displayed.
2. Press **Activate** to initiate BP monitoring.
3. From the **Site Name** drop-down list, select the required site for monitoring.
4. Press **BP** to return to the BP menu
   –or–
   Press **Main Screen** to return to the main screen display.

CHAPTER 19:
CARDIAC OUTPUT (C.O.)

Overview

Cardiac Output is measured using the thermodilution method in which one or more injections of cold saline solution is introduced into a central vein. The resulting temperature variation in the pulmonary artery is then measured.

Each injection results in the display of a thermodilution curve representing blood temperature deviation. Up to six injections can be compared for thermodilution response curves and corresponding data.

The Menntor X7 Bedside Monitor guides you through the procedure and notifies you of invalid injections or other procedural problems. The results of all completed injections can be stored in patient charts for later review.

When the patient's height and weight have been entered in the **Patient Identification** panel upon admission or at any other time preceding the Cardiac Output procedure, the computed Body Surface Area (BSA) is used to calculate cardiac indexes. If the patient's height and weight have not as yet been entered, the **Patient Identification** panel can be accessed from the **Cardiac Output** menu and the information entered.

Clinical Precautions

The accuracy of C.O. calculations depends on the proper placement of the Swan-Ganz catheter. Advancing the distal lumen too far into the pulmonary artery may result in an insufficient thermodilution curve. Respiratory artifact may also prevent an accurate C.O. calculation. Retracting the distal lumen too far toward the pulmonary valve may also cause calculation errors due to catheter whip.

Preparatory Checklist

- Plug the C.O. interface cable into the socket.
- Make sure that all connectors (injectate probe connector, catheter thermistor connector) are properly connected to the C.O. interface cable.
- In the **Acquire** panel, make sure that the computational constant is correct for the catheter and amount of injectate used in the procedure.
- Make sure that the patient's height and weight appear in the **Patient Identification** panel.
- Access the **Acquire** panel and begin the procedure.
- When you have taken all the measurements you require (up to six), you can edit the results in the **Edit Curves** panel.

The procedures that can be performed using the panels available from the Cardiac Output menu are more fully explained in the following paragraphs.

Measuring Procedures

Cardiac Output measurement is set up through the **Cardiac Output** menu dialog panels. Each dialog panel enables control of different aspects of C.O. monitoring. The available panels are:

- Acquire

  Use this panel during the injection procedure in order to acquire the necessary data for computing cardiac output. See "Acquiring Data for Determining Cardiac Output" on page 19-3.

- Catheter Information

  Use this panel to view and change the computational constant for the catheter used in the procedure. See "Defining Catheter Information" on page 19-6.

- Patient Identification

  Use this panel to enter the patient's height and weight in order to compute the Body Surface Area (BSA) if this information was not entered previously. See "Entering Patient Information" on page 19-7.

- Edit Curves

  Use this panel to view up to six accepted trial curve graphs, along with a central graph where all curves are displayed on a single axis for comparison. See "Editing Curves" on page 19-8.

All panels can be accessed from the **Cardiac Output** menu.

Accessing the Cardiac Output Menu

The **Cardiac Output** menu is accessed from the **Vital Signs** menu.

➤ ***To access the Cardiac Output menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **Cardiac Output**.

Acquiring Data for Determining Cardiac Output

This panel leads the user through the process of performing Cardiac Output injections and acquiring the resulting data. Two graphs are displayed in the panel: **Current** which presents data on the current injection and **Previous** which presents an average of the data on the most recent injections (up to six).

Procedure indicators appear in the space between the two graphs. These indicators are:

- Wait - for thermal ready state
- Ready - begin injecting
- Injecting - in progress
- Done - process complete

After each injection, the procedure indicator returns to “Wait” in anticipation of the next injection. After the sixth injection, the message **Six valid injections already conducted** appears.

If an error occurs during an injection procedure, an error message appears below the procedure indicator. The possible error messages are:

- Baseline Temperature Error

  This message appears if blood temperature has deviated more than 0.067° C within the two second interval immediately preceding the “Ready” prompt. A typical cause of this error is cardiac pumping which causes the baseline temperature to vary.

- Curve Error

  This message appears if blood temperature does not change sufficiently to enable C.O. to be computed. Typical causes are false starts (small amount of injectate less than volume shown in data field), or injection is performed too slowly. When this is the case, no C.O calculation is attempted.

- Delta Temperature Exceeds 10%

  This message indicates that the injectate temperature (for COSet™) or the injectate bath temperature (for separate bath injectate probes) is outside the

acceptable range for C.O. calculation. Acceptable temperature ranges are shown on page 19-6.

- Injected Temperature Probe Out

  This message appears if the injectate bath temperature probe is not connected, or is defective.

- Body Temperature Probe Out

  This message appears if the body temperature probe is not connected, or is defective.

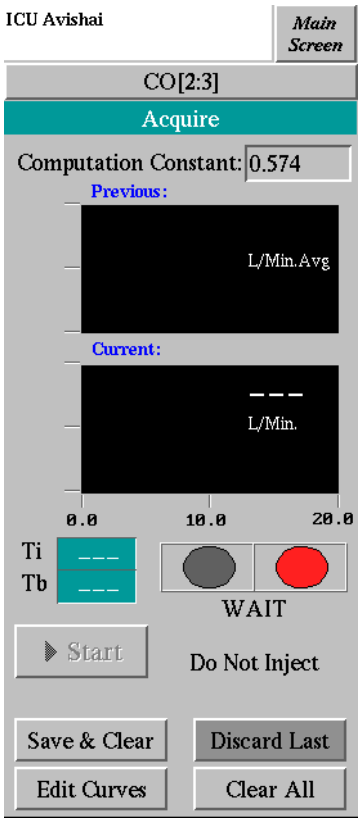


Figure 19-1: The Cardiac Output Acquire Panel

➤ ***To run a C.O. trial:***

1. Prepare the injectate.
2. When the **Ready** procedure indicator appears, press **Start,** wait for a message **"Start Injection"** (green light and voice message) and then begin injecting. You have 12 seconds to complete the injection. Inject smoothly and rapidly. Any problems that might arise are indicated by error messages. Values appear in the graphs and the average is updated automatically.

3. Press **Discard Last Measurement** to clear data on the last injection in the **Current** graph.
4. Press **Clear All Measurements** to clear the average and all data in the **Previous** graph.
5. Press **Save and Clear Measurements** to save the average CO and clear all graphs. The data is accepted and will be displayed as the last measured CO.
6. Press **CO** to close the panel, and return to the CO menu
   –or–
   Press **Main Screen** to close the panel, and return to the main screen display.

Note: *During the Cardiac Output thermal dilution procedure the CVP alarms are disabled, to prevent alarms during the cold saline injection into the central vein.*

Cardiac Output Measurement

Sources of Errors:

- Physiological Reasons
  - Patient movement during the procedure.
  - Anxious patient.
  - Variations in cardiac rate and rhythm.
  - Cardiac abnormalities (for example, incompetent valves).
- Catheter-related Errors
  - Balloon inflated during measurement.
  - Catheter not positioned properly.
  - Damaged catheter.
- Injection Errors
  - Use of the wrong catheter injection port.
  - Poor timing of injection.
  - Incorrect volume of injectate.
  - Inaccurate injectate temperature.
- Instrument Errors
  - Incorrect computation constant.
  - Instrument failure

Defining Catheter Information

The Computation Constant can be viewed and defined in this panel.

The Menntor X7 automatically determines the injectate temperature by using either a separate bath probe or the COSet™ injectate probe. Enter the catheter computation constant in the Catheter Information panel. The Menntor X7 uses the Computation Constant to determine the correct K-factor for catheter and the injectate volume which are used in the calculation of cardiac output. The K-factor adds a coefficient, based on catheter French size, injectate volume and injectate temperature. This compensates for the warming of the injectate as it passes through the catheter lumen.

The Menntor X7***s*** allows manual entry of the Computation Constant for the catheter being used. When entering or accepting Computation Constants, verify that Computation Constant are being used and not K-Factors which some manufacturers provide with the catheter.

To convert a K-factor to a computational constant, see Table 19-19-1.

Table 19-1: K-Factor Conversion

Inj. Method	*Inj. Temp (°C)*	*Vol. (ml)*	*2.5F*		*4.5F*		*7F*		*7.5F*	
			STD	*Spectra-med*	*STD*	*Spectra-med*	*STD*	*Spectra-med*	*STD*	*Spectra-med*
Ice Bath	0-5	10 5 3			.576 .272 .153	 .279 .160	.542 .247 .132	.566 .270 .151	.563 .257 .143	.566 .270 .151
Closed Inj. System	6-12 8-16	10 5	.623 .310		 .368	 .291	.561 .259	.579 .281	.574 .287	.579 .281
Room Temp	19-22	10 5 3			.599 .292	 .316 .188	.578 .274 .154	.628 .309 .180	.582 .277 .156	.628 .309 .180
Bath	23-25	10 5 3			.618 .302 .177	 .316 .188	.596 .288 .165	.628 .309 .180	.607 .293 .170	.628 .309 .180
Room Temp Closed	18-25	10 5	.638 .320		 .342	 .316	.691 .349	.629 .309	.595 .349	.629 .309

➤ ***To enter the computational constant:***

1. From the **Cardiac Output** menu, select **Acquire**.
2. Select the **Computation Constant** field. Use the QuicKnob™ to enter the required constant (allowed range: a decimal point followed by up to three digits).

3. Press **CO** to close the panel and return to the CO menu
   –or–
   Press **Main Screen** to close the panel and return to the main screen display.

Entering Patient Information

If cardiac indexes are required, the Body Surface Area (BSA) must be calculated before the C.O. calculation routine. Menntor X7 automatically calculates the BSA from patient height and weight. If these parameters were not entered in the **Patient Identification Panel** when the patient was admitted, or at some other time, this information can be entered by accessing the **Patient Identification** panel from the **Cardiac Output** menu.

➤ ***To fill out patient height and weight:***

1. From the **Cardiac Output** menu
   –or–
   if you are already in another **Cardiac Output** panel, from the drop-down menu below the panel title area, select **Patient Identification**. The **Patient Identification** panel is displayed.
2. Select **Height** and **Weight**.
   - Turn the QuicKnob™ until the required area is highlighted and then press. The area is selected.
   - Turn the QuicKnob™ clockwise and counterclockwise to increase or decrease the value of the selected parameter on the panel.
   - When you have reached the required value, press the QuicKnob™ again to enter the value into the system. Once both height and weight are entered, the Menntor X7 automatically calculates BSA and displays the resulting value in the **Patient Identification Panel**.
3. Press **CO** to return to the **CO** menu
   –or–
   Press **Main Screen** to return to the main screen display.

Editing Curves

Up to six accepted trial curve graphs are displayed in the **Edit Curves** panel, along with a central graph where all curves are displayed on a single axis for comparison. Each graph is labelled with the corresponding injection number.

All graphs included in the central graph are also included in averages computation. When a graph is removed, its associated values are removed from the average. Computations appear in the center of the panel below the central graph. These computations include: Cardiac Output (C.O.), Cardiac Index (C.I.), Pulmonary Vascular Resistance (PVR), Stroke Volume (SV), Pulmonary Vascular Resistance Index (PVRI) and Stroke Volume Index (SVI).

A toggle button appears next to each graph (except the central graph). When the displayed curve is included in the computations, the button label reads **Delete**. When you press **Delete,** the curve is removed from the C.O. calculations and from the central graph and the button label changes to **Restore**. When you press **Restore**, the curve is returned to the central graph and included in the C.O. calculations and the button label changes to **Delete**.

All trials are automatically averaged. If the Menntor X7 is connected to a printer, the data can be printed out.

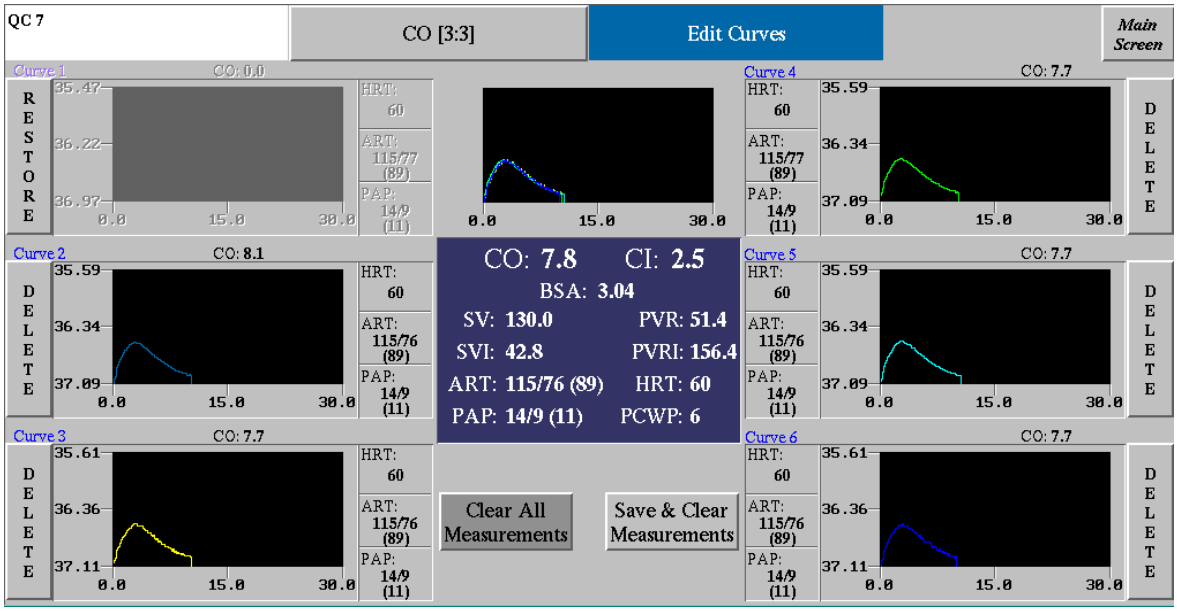


Figure 19-2: The Cardiac Output Edit Curves Panel

➤ ***To edit C.O. curves:***

1. From the **Cardiac Output** menu
   –or–
   if you are already in another **Cardiac Output** panel, from the drop-down menu below the panel title area, select **Edit Curves**
   –or–
   if you are already in the **Acquire** panel, select **Edit Curves**.

2. Press **Delete** to remove the selected curve from the central graph and remove the associated data from C.O. calculations. The curve is dimmed, the graph background is grayed, and the button label changes to **Restore**.
3. Press **Restore** to restore the selected curve to its active state, return it to the central graph and include its associated data in C.O. calculations. The button label changes to **Delete**.
4. Press **Clear All Measurements** to delete all data acquired so far.
5. Press **Save and Clear Measurements** to save the acquired data and clear the graphs.
6. Press **CO** to close the panel and return to the CO menu
   –or–
   Press **Main Screen** to close the panel and return to the main screen display.

Cardiac Output Fick Method

The Fick method enables calculation of Cardiac Output using a non-invasive procedure. The Fick method is based on the following parameters:

- SpO_2
- SvO_2
- O_2 Consumption
- Hemoglobin

These parameters are provided by the Menntor X7 or acquired using other monitoring equipment, in which case you must manually enter them.

The formula for calculation of the Cardiac Output is:

$$CardiacOutput_{Fick} = \frac{O_2Consumption \times 10}{(SpO_2 - SvO_2) \times HB \times 1.34}$$

Upon calculation of Cardiac Output, the C.O. Fick method automatically calculates Cardiac Output associated parameters: Cardiac Index, Stroke Volume, Stroke Index, Systemic Vascular Resistance, Systemic Vascular Resistance Index, Pulmonay Vascular Resistance, Pulmonay Vascular Resistance Index. All values are stored in the patient chart.

The calculated C.O. is displayed in the C.O. display area on the screen.

➤ ***To activate the C.O. Fick Method:***

1. From the **Cardiac Output** menu, select **Fick Method**. The **Fick Method** panel opens.

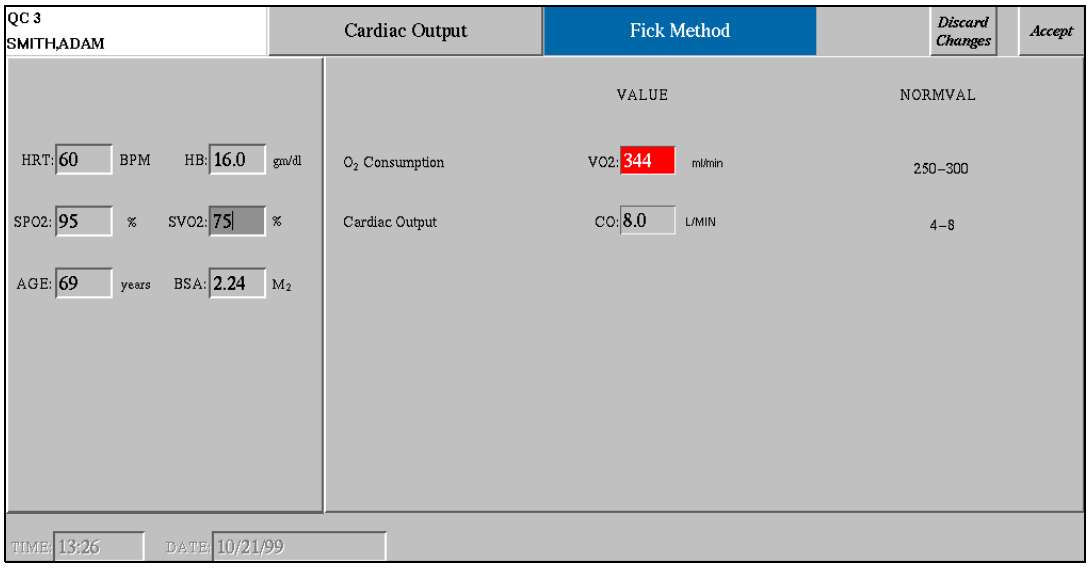


Figure 19-3: Cardiac Output Fick Method Panel

2. On the left area of the panel, enter all missing parameters. Parameters are either provided by the Menntor X7, or acquired using other monitoring equipment, in which case you must manually enter them:
   - HRT - provided by the Menntor X7
   - HB - enter manually
   - SpO2 - calculated by the Menntor X7/enter manually
   - SvO2 - provided by the Menntor X7/enter manually
   - Age - provided by Menntor X7
   - BSA - calculated by the Menntor X7

   Update any value, if necessary.
3. When all values are entered, O_2 Consumption and Cardiac Output values appear on the right side of the panel.

   Values that are out of range appear on a red background.
4. Click **Accept**. The **Hemodynamics** chart opens, displaying the Cardiac Output result and associated parameters. Fick Method results are indicated by the icon .

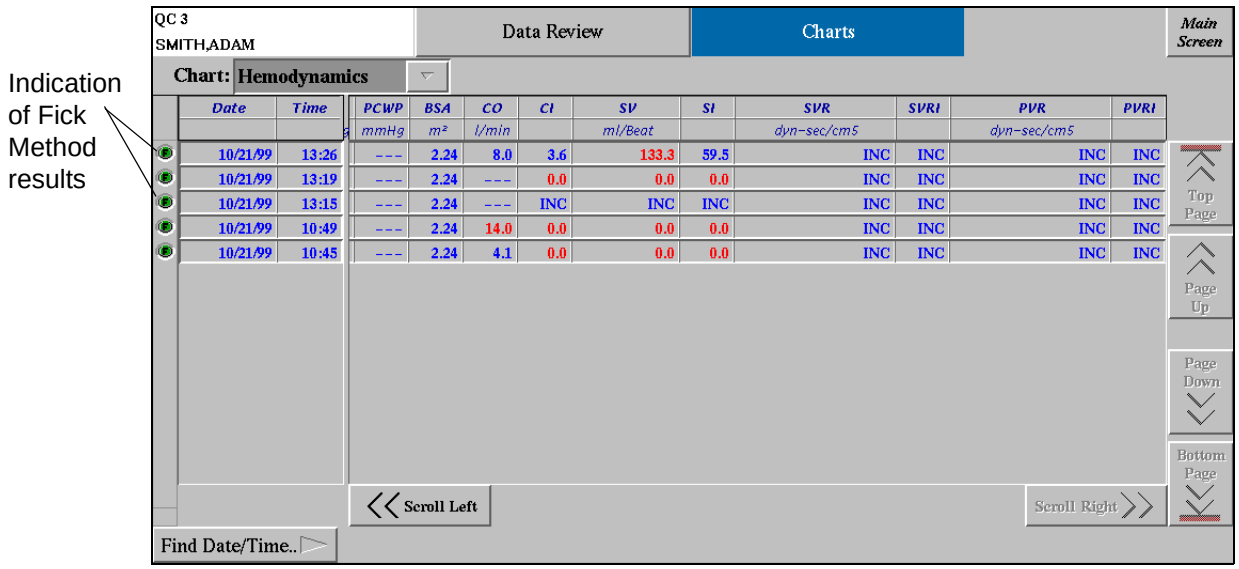


Figure 19-4: Hemodyancis Chart displaying Fick Method Calculations

CHAPTER 20: TEMPERATURE

Overview

Temperature is detected either through the Temp. input or from the CO/2 Temp. input when Cardiac Output (CO) is not being monitored.

Preparatory Checklist

- ☐ If the CO/2Temp input is used, insert the 2Temp.adapter cable in the CO/2Temp socket.
- ☐ Connect the temperature probe.
- ☐ Attach the probe to the patient, making sure that the probe is secure.
- ☐ In the **Activate** panel, make sure that temperature monitoring is activated.
- ☐ Change temperature monitoring settings, if necessary. Temperature monitoring procedures are described in detail in the following paragraph.

Temperature Monitoring Procedures

The **Temperature** panel provides access to the specific dialog panels enabling interaction with all aspects of **Temperature and Delta Temperature** monitoring. Each dialog panel enables control of different aspects of **Temperature** monitoring. The available dialog panels are:

- **Alarm Limits**

  Use this panel to activate and set limits for high and/or low limit alarms. See “Setting Temperature Alarm Limits” on page 20-3.

- **Alarm Response**

  Use this panel to define the way the Menntor X7 visually and audibly responds to a detected alarm. See “Setting Temperature Alarm Response” on page 20-5.

- **Display Options**

  Use this panel to define how temperature values appear on the main screen display. See “Setting Temperature Display Options” on page 20-6.

- **Activate**

  Use this panel to activate or deactivate, discontinue, and resume **Temperature** monitoring, and to define the location of the probe. See “Activating Temperature Monitoring” on page 20-7.

  All the above panels are accessed from the **Temperature** menu.

Accessing the Temperature Menu

The **Temperature** menu can be accessed from the **Vital Signs** menu, or from the main screen display.

➤ ***To access the Temperature menu from the Vital Signs menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **Temperature**. The **Temperature** menu appears.
3. Select the required menu item to display the associated panel.

➤ ***To access the Temperature menu from the main screen display:***

- When the temperature is displayed in **Big Number** format
  –or–
  when temperature appears in the Secondary Vital Signs area, turn the QuicKnob™ until the Temperature value is displayed. In either case, the area where the temperature value is displayed functions as an on-screen button. Press the QuicKnob™ to select. The **Temperature** menu appears.

Setting Temperature Alarms

Temperature alarm parameters are set in the **Alarm Limits**, and **Alarm Response** panels. Each dialog panel controls a different aspect of Temperature alarms.

Setting Temperature Alarm Limits

Use this panel to set Temperature alarm limits. The current low and high alarm limits as well as the currently measured temperature are displayed on the panel. The current limits appear in the Low/High Limit Value boxes on the panel. The current temperature is marked on the scale.

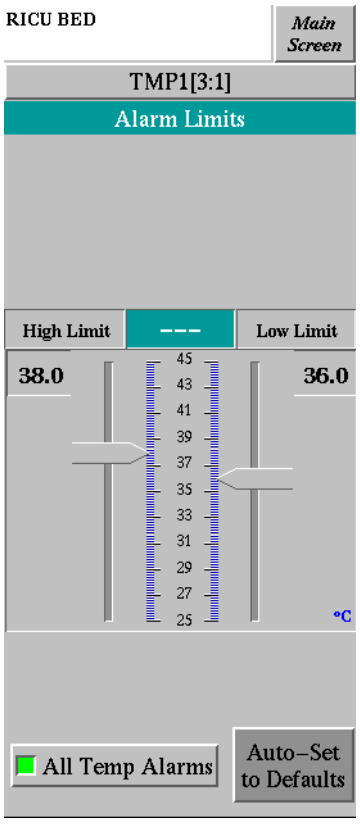


Figure 20-1: The Temperature Alarm Limits Panel

➤ ***To set the Temperature Alarm Limits panel:***

1. From the Temperature menu
   –or–
   if you are already in another **Temperature** panel, from the drop-down list below the title area, select **Alarm Limits**. The panel is displayed.
2. Select the **All TEMP Alarms** checkbox to activate or deactivate both high and low limit alarms.
3. Using the QuicKnob™, move the markers on the low/high alarm limits slider bars along the displayed scale to set the required limits. The right marker sets the low alarm limit and the left marker sets the high alarm limit. The allowed range is 25-43° C.
   –or–
   Press **Auto-Set to Defaults** to set all temperature alarm limits to their default values.
4. Press **Temp** to close the panel and return to the Temp menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting Temperature Alarm Response

The **Alarm Response** panel controls how the ***Menntor X7*** responds to temperature alarms.

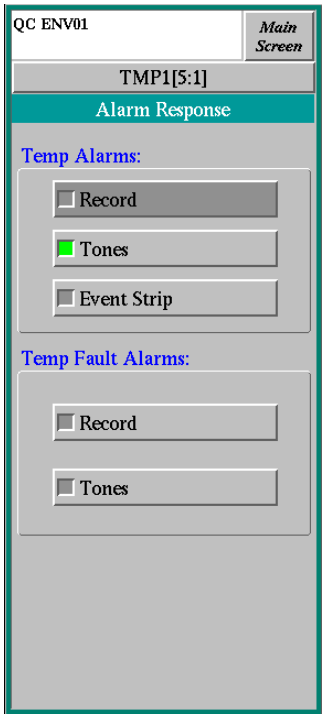


Figure 20-2: The Temperature Alarm Response Panel

➤ ***To set alarm responses:***

1. From the **Temperature** menu
   –or–
   if you are presently in another **Temperature** panel, from the drop-down list below the panel title area, select **Alarm Response**.
2. Select the **Record** checkbox to activate or deactivate recording of the patient's ECG during the alarm event. By default, Record is deactivated.
3. Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
4. Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.
5. Press **Temp** to close the panel and return to the Temp menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting Temperature Display Options

The **Display Options** panel controls how temperature values are presented on the main screen display. Any changes made immediately update the main screen display.

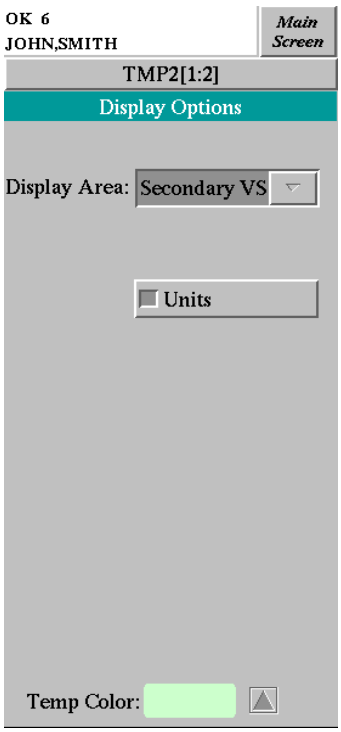


Figure 20-3: The Temperature Display Options Panel

➤ ***To set Temperature Display Options:***

1. From the **Temperature** menu
   –or–
   if you are already in another **Temperature** panel, from the drop-down list below the panel title area, select **Display Options**.
2. Press **Display Area** and select the area on the main screen display where you want temperature to appear from the drop-down list. The available options are: **Secondary VS** or **Big Numbers**. The default is **Secondary VS**.
3. Select the **Units** checkbos to activate or deactivate display of measurement units. By default, the option is activated.
4. Press **Temp Color** and, from the panel that appears, select the display color for all temperature values on the main screen.

5. Press **Temp** to close the panel and return to the Temp menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Activating Temperature Monitoring

Use the **Activate** panel to activate or deactivate measuring and monitoring temperature.

➤ ***To activate or deactivate temperature monitoring:***

1. From the **Temperature** menu
   – or–
   if you are already in another **Temperature** panel, from the drop-down list below the panel title area, select **Activate**.
2. Select the **Activate** checkbox to activate or deactivate temperature monitoring. By default, Temperature monitoring is activated.
3. Press **Temp** to close the panel and return to the Temp menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

• ***To assign a temperature name:***

Use the activate panel to assign or unassign a temperature name for each temperature input and to activate or de-activate a temperature input connector.

➤ ***To activate an unassigned Temp.:***

1. Open the **Vital Signs** menu
2. Select a **Temp** (unassign).
3. Select a **Site Name -** the alternatives are:
   TMP1, TMP2, TMP3, TMP4, TMP5, TMP6, TMP7, TMP8
4. The selection assigns and activates two temperature parameters simultaneously.

➤ ***To de-activate an active Temp.:***

1. Select a TMP$_{Num}$ key and open the TMP$_{Num}$ menu - the active button is green
2. Press on the **Active** button to de-activate, and save the asignment

3. Press **Unassign Temp** to de-activate and unassign a pair of temperatures related to the common input.

Setting Delta Temperature

In certain clinical situations, measuring temperature at two different sites on the patient and comparing the difference between them is important. The detected difference between the temperatures is called the **Delta**. This can be the difference between the patient's body temperature and the temperature of the environment, such as a neonate in an incubator. The delta indicates how well the neonate is maintaining body temperature.

Another example is the difference in temperature between two parts of the same patient's body. When measuring toe and core temperature in a post-cardiac surgery patient, the delta temperature indicates the state of peripheral circulation.

The patient's body temperature is measured at two sites. The temperature measured at the site defined in this panel is used for comparison to the temperature taken at the site defined in the **Activate** panel. Use this panel to define the second site and to set alarm limits for **Delta Temperature**. The current low and high alarm limits as well as the currently measured delta temperature are displayed on the panel.

➤ ***To set delta temperature alarms:***

Note: *Delta temperature can be measured on the **Menntor X7** by use of a two temperature adapter cable connected to the orange CO/2 Temp socket. One pair of delta temperatures ia available: T4-T3. Delta temperature can be activated only if both the temperatures of a specific pair are active.*

1. From the **TMP4-TMP3** menu
   –or–
   if you are already in another **TMP4-TMP3** panel from the drop-down list
2. Select the **Alarm Limits** checkbox to activate or deactivate the low/high alarm limit only. By default, both the low and high alarms are activated.
3. Using the QuicKnob™, move the markers on the low/high alarm limits slider bars along the displayed scale to set the required limits. The right marker sets the low alarm limit and the left marker sets the high alarm limit.
   –or–
   Press **Auto-Set to Defaults** to set delta temperature alarm limits to default values.

4. Press **T4-T3** to close the panel and return to the **T4-T3** menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *The following options are operated in the same way for Delta Temperature as for regular Temperature monitoring - refer to the relevant section above in regular Temperature monitoring:*

- Setting the Delta Temperature **Alarm Response**
- Setting the Delta Temperature **Display Options**
- **Activating** Delta Temperature

CHAPTER 21:
NON-INVASIVE BLOOD PRESSURE (NIBP)

Overview

Non-Invasive blood pressure is measured using a cuff and is derived by the oscillometric method. The cuff is automatically inflated and systolic, diastolic and mean pressures are derived as the cuff deflates. Adults and neonates may be monitored.

The ***Menntor X7*** bedside monitor can be configured to take NIBP readings in one of three modes: manual, automatic and stat mode.

- In the manual mode, a single NIBP measurement is taken as required.
- In the automatic mode, measurements are repeated at regular, pre-set intervals.
- In the stat mode, blood pressure is measured as many times as possible during a period of five minutes.

Readings can be logged in the patient's chart.

Note: *During NIBP operation, isolated readings may be displayed which indicate a significant change in blood pressure values. This may have been caused by a change in the patient's actual pressure or by a movement artifact, muscle tremors, or a weak pulse. Take a manual ausculatory blood pressure to verify the patient's pressure before administering any medication.*

Note: *Inflation pressures used in adult NIBP monitoring are not appropriate for nonates. Also, neither the pediatric nor the adult cuff is suitable for neonates. The width of the cuff for neonates should be 50% of the limb circumferece or 2/3 of the upper arm length. The inflation part of the cuff should be long enough to encircle 50-80% of the limb.*

Limitations of the Oscillometric Method

The patient's actual condition at the time of measurement has a direct bearing on the reliability of that measurement. When taking an NIBP measurement, a regular arterial pressure pulse is sought. When a patient's condition makes that pulse hard to detect, it may take longer to get a reading and the reading may be unreliable. In some cases, the patient's condition may make it impossible to take a reading.

The following conditions may interfere with the oscillometric method:

- Heart-Lung Machine - It is impossible to take an NIBP reading when a patient is connected to a heart-lung machine.
- Arrhythmia - An irregular heartbeat caused by cardiac arrhythmia may cause the NIBP reading to be unreliable or impossible to perform. Again, measurement time is increased.
- Changes in Pressure - If a patient's blood pressure changes rapidly over the period of time during which the arterial pressure pulses are being analyzed for the reading, the measurement will be unreliable and may be impossible to obtain.
- Patient Movement - Patient movement, shivering, tremors, and convulsions may interfere with detection of parterial pressure pulses. NIBP measurements may be unreliable or impossible to perform. In any case, measurement time is increased.
- Heart Rate Extremes - An NIBP reading cannot be taken if the patient's heart rate is less than 40 BPM or more than 300 BPM.
- Severe Shock - Reduced blood flow to the extremities due to shock or hypothermia causes reduced pulsations of the arteries. This causes the NIBP readings taken under such conditions to be unreliable.
- **Limitations for Neonates** - Due to the small size of arteries in premature babies and in neonates, it becomes more difficult to sense the arterial pulse. To achieve optimal results in Neonatal NIBP:
  1. Use the shortest practical tube length possible between the NIBP inputs and the Cuff. Use approximately 1.5 meters as a practical compromise.
  2. Do not tighten the Cuff on the baby's limb. Leave a space of approximately 5 mm between the Cuff and the limb.

Preparatory Checklist

- ☐ Select the correct cuff size for the patient. Cuff width should be either 40% of the arm's circumference or 2/3 the upper arm length. If you are unsure whether the cuff is large enough, use a larger cuff.
- ☐ Connect the fitting at the end of the pressure hose to the corresponding fitting on the cuff and the monitor.
- ☐ Ensure that the cuff is not open and that fittings are tight to prevent air leaks. No reading can be obtained when cuff is open and the message **Air Leak** appears on the main screen display.

Note: *An incorrect cuff size, especially a normal cuff on obese patients, may result in incorrect readings.*

2. *Always take care to avoid compression or restriction of pressure tubes.*

Warnings

- Do not perform NIBP measurements on patients with sickle-cell anemia or any condition involving skin damage.
- Do not apply the cuff to a limb where an intravenous infusion or catheter is inserted. The infusion is slowed or blocked during cuff inflation, and tissue damage may result around the catheter.
- Due to the risk of hematoma in the limb where the cuff is placed, use clinical judgment when deciding whether or not to perform automatic blood pressure readings on patients with severe blood clotting disorders.
- It is important when measuring blood pressure in pediatric patients, to make sure that the ***Menntor X7*** is correctly configured for pediatric readings, due to the lower overpressure level used.

CAUTION! *While in normal use it is not possible to connect the Male Luer Lock connector of infusion sets into the Female Luer connector of the NIBP hose, there are situations and accessories that will enable the possible connection of the female Luer at the end of the NIBP hose to an infusion set inserted into a vein.*
This could deliver air into patient's venous system resulting in a potentially lethal air embolism.
The NIBP hose has different color and texture to standard infusion sets, which are normally clear, to allow visibility of the infused fluid. Users of NIBP systems are warned to take care, and

instruct the medical staff, nurses and doctors about the risk involved.

Monitoring Procedures

The **NIBP** menu provides access to all the specific dialog panels enabling interaction with all aspects of NIBP monitoring. Each dialog panel enables control of different aspects of NIBP monitoring. A short description of the panels, in the order they appear on the **NIBP** menu, follows:

- **NIBP Start Measurement**

  A “Start NIBP” button is present in the NIBP menu to begin NIBP measurement. This Start NIBP button can also be made into a QuicKey™, if desired.

- **Reading Intervals**

  Use this panel to control measuring and monitoring of non-invasive blood pressure. You can specify that a reading be taken at pre-set intervals and define those intervals, and you can also manually initiate a blood pressure reading. See “Setting Reading Intervals” on page 21-6.

- **Cuff Type**

  Use this panel to define the cuff size used on the monitored patient. See “Selecting the Cuff Type” on page 21-9.

- **Alarm Limits**

  Use this panel to activate/deactivate and set NIBP low and high alarm limits. You can enable either low or high limits alarms, or both. See “NIBP Alarm Limits” on page 21-10.

- **Alarm Response**

  Use this panel to define how the ***Menntor X7*** visually and audibly responds to detected alarms. See “Setting NIBP Alarm Response” on page 21-12.

- **Display Options**

  Use this panel to define how NIBP values appear on the main screen display. See “Setting NIBP Display Options” on page 21-13.

- **Activate**

  Use this panel to activate or deactive monitoring of NIBP. See “Activating NIBP Measuring and Monitoring” on page 21-15.

Accessing the NIBP Menu

The **NIBP** menu can be accessed from the **Vital Signs** menu, or from the main screen display.

➤ ***To access the NIBP menu from the Vital Signs menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **NIBP**. The **NIBP** menu appears.
3. Select the required panel from the menu.

To access the NIBP menu from the main screen display:

1. When **NIBP** is displayed in a parameter slot in the primary display area (waveform area) , turn the QuicKnob™ until the **NIBP** parameter key is highlighted. The parameter key functions as an on-screen button. Press the QuicKnob™ to select the parameter key and access the **NIBP** menu.
2. When NIBP is displayed in the Secondary Vital Sign area, or in Big Number format, turn the QuicKnob™ until the **NIBP** value is highlighted and press to select. The **NIBP** menu appears.

Setting Reading Intervals

The NIBP **Reading Intervals** panel controls measuring and monitoring of non-invasive blood pressure. The automatic mode enables taking blood pressure readings at pre-set intervals. There are five options for selecting automatic intervals:

- **Off** disables automatic NIBP reading.
- **Single-T Interval** - A single interval can be selected. A reading is taken every selected interval. The first reading is taken immediately and the next readings are taken at the selected interval. For example, if NIBP is activated at 10:23 and the interval is set for T-15, the first reading is taken immediately and the next readings are taken at 10:38, 10:53, 11:08, etc.
- **Single-Q Interval** - A single interval is selected. The first reading is taken at the beginning of the next hour and the next readings are taken according to the selected interval. To return to the previous example, if NIBP is activated at 10:23, and the interval is set for Q15, the first reading is taken at 11:00, and the subsequent readings are taken at 11:15, 11:30, 12:00, etc.
- **Multiple-T Interval** - Up to three time intervals (periods of reading) can be selected. The readings are taken at the selected intervals.

- **Multiple-Q Interval** - Up to three time intervals (periods of reading) can be selected. The first readings are taken immediately, the next readings are taken according to the selected intervals

Note: *It is possible to simplify the reading intervals control by activating only the Single T mode or Single Q mode, in System Setup. Refer to the system manager for activating this mode of operation.*

A manual reading can be taken by pressing the **Start NIBP** button.

A series of readings taken consecutively during a five-minute period can be initiated by activating the **Stat Mode** option.

Note: *In system setup (password protected) - Vital Signs - NIBP, it is possible to simplify the automatic mode by activating only the Single T or Single Q.*

WARNING!!! *Do not monitor patients who demonstrate tremors, seizures, or other movement disorders in the Automatic mode. Limb tremors or movement during a reading may cause excessively elevated cuff pressure for prolonged periods, causing venous congestion.*

WARNING!!!: *Patients in shock, in vasodilation, or in other states which may cause a very weak pulse are also contraindicated for automatic mode monitoring.*

WARNING!!!: *Set the interval function to **Off** and initiate each reading manually after checking to see that the limb is not moving or trembling.*

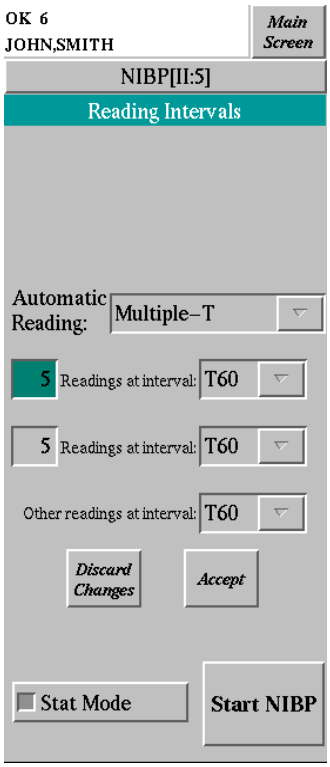


Figure 21-1: The NIBP Reading Intervals Panel

To set the NIBP reading intervals:

1. From the **NIBP** menu
   –or–
   if you are already in another **NIBP** panel, from the drop-down list below the panel title area, select **Reading Intervals**.
2. From the **Cuff Type** drop-down list, select the required cuff type. Available options are: **Adult**, and **Neonatal**. The default option is **Adult**.
3. From the **Automatic Reading** drop-down list, select an option for setting measurement intervals. The available options are: **Off**, **Single-T Interval**, **Single-Q Interval**, **Multiple-T Interval**, and **Multiple-Q Interval**.
4. When a single interval is selected (T or Q), select **Single Interval** to display the drop-down list and select the required interval (in minutes). The available intervals are **T2**, **T3**, **T4**, **T5**, **T10**, **T15**, **T20**, **T30**, **T40**, **T50**, and **T60** minutes for T intervals; **Q1**, **Q2**, **Q5**, **Q10**, **Q15**, **Q30**, **Q60**, and **Q120** minutes for Q intervals.
5. When a multiple interval is selected (T or Q), select **Multiple Interval** to display the drop-down list and select the required interval in minutes. The available intervals the same as for single intervals.

6. Press **Start NIBP** to initiate a manual NIBP reading. The button label changes to **Stop**. Press to stop the measurement and depress cuff (reading is not performed).
7. Select the **Stat Mode** checkbox to activate a series of readings performed consecutively during a five-minute period. **Start NIBP** is disabled during this time. At the end of the **Stat Mode** period, the checkbox is automatically deactived and the **Start NIBP** button is re-enabled.
8. Press **NIBP** to close the panel and return to the NIBP menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Selecting the Cuff Type

The cuff type used for the currently monitored patient is defined in this panel as **Adult**.

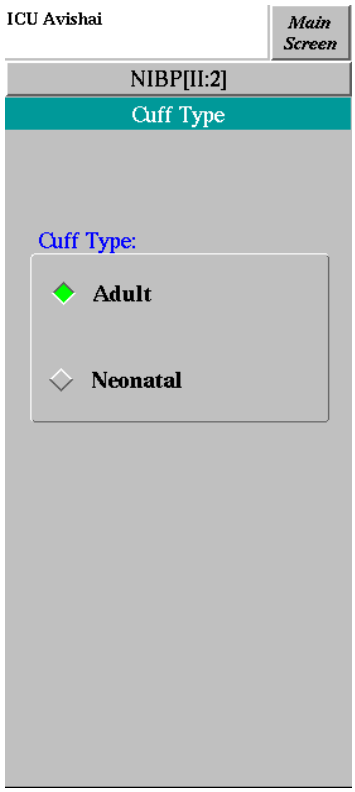


Figure 21-2: The NIBP Cuff Type Panel

To select a cuff type:

1. From the **NIBP** menu
   –or–
   if you are already in another **NIBP** panel, from the drop-down list below the panel title area, select **Cuff Type**.
2. Select the required cuff type for either **Adult** or **Neonatal**.
3. Press **NIBP** to close the panel and return to the NIBP menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting NIBP Alarms

NIBP alarm parameters are set in the dialog panels: **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of NIBP alarms.

NIBP Alarm Limits

NIBP alarm limits are activated and set in the NIBP **Alarm Limits** panel. The current low and high alarm limits and the current NIBP value are displayed on the panel.

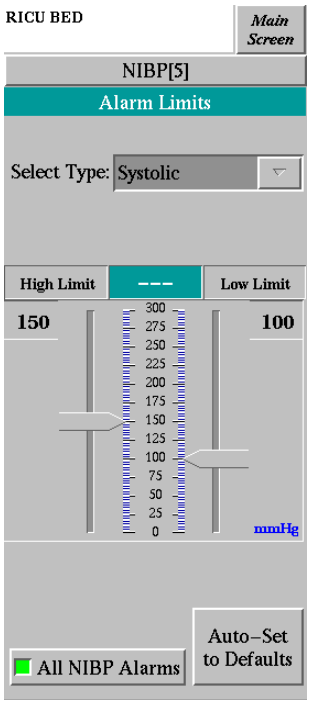


Figure 21-3: The NIBP Alarm Limits Panel

To set NIBP alarm limits:

1. From the **NIBP** menu
   –or–
   if you are already in another NIBP panel, from the drop-down list below the panel title area, select **Alarm Limits**.
2. Press **Select Type** and select either **Systolic**, **Diastolic** or **Mean** from the drop-down list to set the type of blood pressure monitored.
3. Select the **Systolic/diastolic/mean Alarms** checkbox to activate or deactivate alarms.
4. Using the QuicKnob™, move the markers on the low/high alarm limits slider bars along the displayed scale to set the required limits. The right marker sets the low alarm limit and the left marker sets the high alarm limit.The allowed range is 0-300
   –or–
   Press **Auto-Set to Defaults** to set all NIBP alarm limits to their default values.
5. Press **NIBP** to close the panel and return to the NIBP menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting NIBP Alarm Response

The NIBP Alarm Response panel controls how the ***Menntor X7*** responds to NIBP alarms.

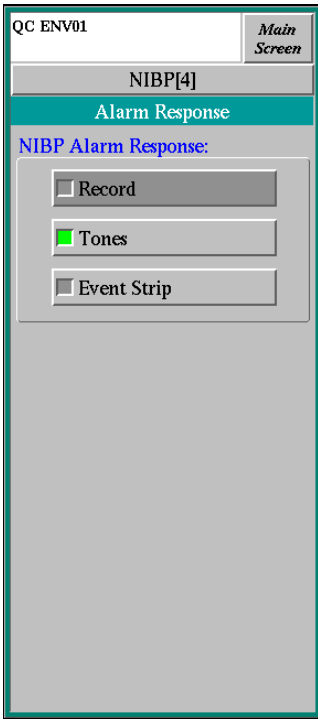


Figure 21-4: The NIBP Alarm Response Panel

To set NIBP Alarm Response:

1. From the **NIBP** menu
   –or–
   if you are already in another **NIBP** panel, from the drop-down list below the panel title area, select **Alarm Response**.
2. Under **NIBP Alarm Response**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.

3. Press **NIBP** to close the panel and return to the NIBP menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting NIBP Display Options

The NIBP Display Options panel controls how NIBP values are displayed on the main screen display. Any changes made immediately update the main screen display.

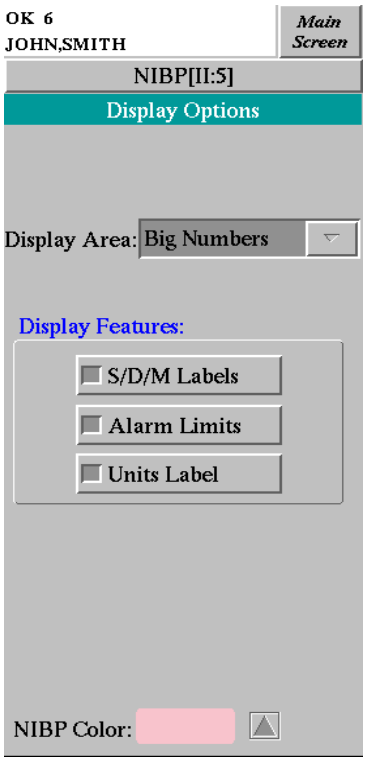


Figure 21-5: The NIBP Display Options Panel

To set NIBP Display Options:

1. From the **NIBP** menu
   –or–
   if you are already in another **NIBP** panel, from the drop-down menu below the panel title area, select **Display Options**.

2. Select **Display Area** and, from the drop-down list, select the area on the main screen display where you want NIBP to appear. The available options are: **Waveform**, **Secondary VS** or **Big Numbers**. By default, NIBP appears in the **Secondary VS** area. When **Waveform** is selected, an NIBP chart is displayed in the waveform area.

3. Select **Numeric Formats** and, from the drop-down list, select the format in which you want NIBP values to appear. When units are displayed in mmHg, the available options are: **SSS/DDD MMM**, **SSS/DDD mmm**, **sss/ddd MMM**, and **MMM** (only). When units are displayed in KiloPascals (KPa), the options are: **SS.SS/DD.DD**, or **MM.MM**. The default numeric format is **SSS/DDD MMM** (for Hg/mm) or **SS.SS/DD.DD** (for KPa).
4. Select the **Current Interval**, **S/D/M Label**, and/or **Units** checkboxes to activate or deactivate display of these values, as required. Each can be activated or deactivated separately.
5. Press **NIBP Color** and from the panel that appears, select the display color for all NIBP values on the main screen.
6. Press **NIBP** to close the panel and return to the NIBP menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Activating NIBP Measuring and Monitoring

NIBP measurement and monitoring is activated or deactivated in the NIBP Activate panel.

To set the Activate panel:

1. From the **NIBP** menu, or from the drop-down list below the NIBP panel title area, select **Activate**.
2. Select the **Activate** checkbox to activate or deactivate NIBP monitoring. By default, monitoring is activated.
3. Press **NIBP** to close the panel and return to the NIBP menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Checkboxes appear green when activated and gray when deactivated.

Technical Messages

Technical Message Code	*Reason for Message*
3	Zero pressure detected
9	Hardware failure
11	Pump failure (adult cuff used in neonatal mode)
12	Diastolic BP too low to measure
13	Motion artifact
14	Inflation not sufficiently above systolic point
15	Abnormal oscillometric waveform detected (may be due to motion)
16	Arrhythmic pulse detected
17	Measurement time-out (may be due to motion)
18	Pulse rate too fast (may be due to motion)
19	Cuff over-pressure sensed
20	Loose cuff
21	Neonatal cuff used in adult mode

Note: *Please note the above technical message codes. Should the code appear on the unit during a NIBP measurement, then the reason for the code is indicated in the above table. User action should be to correct for the cause of failure or notify your service technician of the code indicated and the circumstances under which it occurred.*

CHAPTER 22:
PULSE OXIMETRY (SPO2)

WARNING!!! *Before making decisions on treatment of blood gas, check blood gases using a calibrated Gas Blood Analyzer. Use the monitor alarms and abnormal value as a indication for further check.*

CAUTION! *The monitor supports either Nellcor (Covidien) or Masimo SpO2 technology. Use only accessories of the SpO2 manufacturer.*

Overview

SpO2 is measured to determine a monitored patient's arterial oxygen saturation and pulse rate. Arterial oxygen saturation is the percentage of oxygenated hemoglobin in relation to the total hemoglobin. For example, if 95 percent of the hemoglobin molecules in the arterial red blood cells combine with oxygen, the blood has an oxygen saturation of 95 percent. The SpO2 numeric value represents the percentage of hemoglobin molecules that have combined with oxygen molecules to form oxyhemoglobin.

The ***Menntor X7*** bedside monitor measures oxygen saturation using the Pulse Oximetry method. This continuous, non-invasive method measures the light absorption in the patient's tissue (for example, a finger) to a receiver on the other side.

Absorption by tissue and venous blood is constant. However, the blood flow in the arterioles is pulsatile and, therefore, varies with time. Oxygen saturation of the arterial blood can be derived by measuring light absorption during pulsation. To achieve the measurement in two wavelengths 660 nm and 905 nm in energy ranges of 0.13 mW (min) to 0.79 mW (max), light is emitted.

The ***Menntor X7*** provides continuous monitoring of arterial oxygen functional saturation expressed as a percentage. Moment-to-moment variations in capillary filling are presented as a continuous pulse waveform. The pulse rate is derived from the pulse waveform. SpO2 is detected by the SpO2 algorithm.

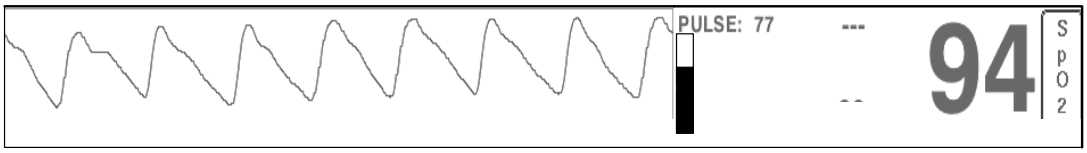


Figure 22-1: Main Screen Display of SpO2 Pulse Waveform

WARNING!!! *The **Menntor X7** SpO2 is not intended for use in the magnetic field of MRI. The magnetic field may interfere with SpO2 measurement, and the sensor may cause artifact in the MRI image.*

CAUTION! *A pulse oximeter should NOT be used as an apnea monitor.*

CAUTION! *A pulse oximeter is an early warning device. Use lab co-oximeter to completely understand the patient's condition.*

Patient Preparation Checklist

- ☐ Verify data reliability by checking that the pulse rate displayed on the monitor approximately corresponds to the patient's palpated pulse rate. SpO2 readings should not fluctuate more than one digit per second.

WARNING!!! *Pulse rate measurement is based on the optical detection of a peripheral flow pulse and therefore may not detect certain arrhythmias. The pulse oximeter should not be used as a replacement or substitute for ECG-based arrhythmia analysis.*

- ☐ Excessive motion at the probe site may result in the display of invalid data. To prevent excessive patient movement, stabilize the site.
- ☐ Select and prepare a probe or sensor suitable for the patient.
- ☐ Make sure that the selected probe or sensor is correctly attached and the detector is flush with the skin. If not, inaccurate SpO2 readings may result. Refer to attachment instructions for the selected probe/sensor.

WARNING!!!: *The disposable sensors are attached to the skin with adhesive tape – they are contraindicated for patients who exhibit allergic reactions to foam urethane products and/or adhesive tape.*

Dress the cable away from sources of electrical interference. Electronic noise emitted from electrosurgery and other electrical devices such as fans can interfere with the signal from the probe.

SpO2 Accuracy Limitations

- Inaccurate measurements may be caused by venous pulsations.
- Inaccurate measurements or loss of pulse signal may be caused by placement of a sensor on an extremity with a blood pressure cuff, arterial catheter or intravascular line.
- The Masimo MS board pulse oximeter can be used during defibrillation, but the readings may be inaccurate for a short time.
- Loss of pulse signal can occur when the sensor is too tight.
- Loss of pulse signal can occur when the patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.
- Loss of pulse signal can occur when there is arterial occlusion proximal to the sensor.
- Loss of pulse signal can occur when the patient is in cardiac arrest or is in shock.

Technical Alarms

Technical alarm messages for SpO2 are as follows:

“Cable Out” and “Relocate Probe”

The alarm warns the user of the technical problem in the following ways:

- Cyan background on the numeric vital sign area.
- Message in the alarm message area
- Audible alarm

Recording of a waveform strip triggered by the alarm

The last two are user controlled and can be activated or deactivated through the “Alarm Response” panel (see below). This enables the user to prevent the audible alarm during periods that the SpO2 sensor is not in use.

“Relocate Probe” is caused by low photo-plethysmographic signal

Before use confirm the alarm activity by disconnecting the sensor cable and by removing the sensor from the patient’s finger.

Common causes of a low signal are:

- Probe site too thick: A large distance between the emitter (LED) and the detector can reduce the signal strength and result in a poor signal. Select a thinner site.
- Poorly perfused site: Select an alternate site or rub site to improve perfusion.

– Dark pigmentation: Very dark skin pigmentation may result in low signal strength. Move the probe to a site with less pigmentation.

– Artificial fingernails or heavy nail polish: Select a different probe site or have patient remove nail polish.

Bright sunlight, bright operating room lighting, infrared heaters, and bilirubin lights may interfere with measurement. If such a problem should arise, shield probe or sensor with opaque material, such as a towel to prevent a poor signal.

CAUTION! *Do not apply tension to the probe cable. Probe damage may result.*

Cleaning

Disposable sensors are for single patient use only and should not be cleaned or disinfected. To clean a re-usable sensor, first remove the sensor from the patient and disconnect it from the patient cable.

Clean the sensor by wiping it with a 70 % isopropyl alcohol pad. Allow the sensor to dry before placing it on a patient.

CAUTION! *Do not soak or immerse the cable in any liquid solution. Do not attempt to sterilize the sensor. Read the cleaning instructions of the sensor manufacturer prior to cleaning the sensor.*

Calibration

The SpO2 and sensors are factory calibrated to functional saturation and do not require calibration. Validation of the calibration can be performed using an SpO2 simulator.

Use Bio-Tek Index 2, SpO2 Simulator or equivalent. Set the simulator to the correct **Make**: Nellcor or Masimo.

Interfering Substances

Carboxyhemoglobin may erroneously increase readings. The level of increase is approximately equal to the amount of carboxyhemoglobin present. Dyes or any substances that contain dyes which change usual arterial pigmentation may also cause erroneous readings.

SpO2 Sensors

The ***Menntor X7*** monitor uses either Nellcor or Masimo SET technology and Masimo sensors (see Appendix at the end of this Chapter).

Monitoring Procedures

The **SpO2** menu provides access to all the specific dialog panels enabling interaction with all aspects of SpO2 monitoring. Each dialog panel enables control of different aspects of NIBP monitoring. A short description of the panels, in the order they appear on the **SpO2** menu, follows:

- **SpO2 Alarm Limits**

  Use this panel to activate/deactivate and set SpO2 low alarm limits. See “Setting SpO2 Alarm Limits” on page 22-6.

- **Pulse Rate Alarms**

  This panel functions similarly to the **Alarm Limits** panel, but activates/deactivates and sets pulse rate alarms. See “Setting SpO2 Pulse Rate Alarms” on page 22-8.

- **Alarm Response**

  Use this panel to define how the ***Menntor X7*** responds to detected alarms. See “Setting SpO2 Alarm Response” on page 22-9.

- **Sensitivity (Masimo only)**

  Switch between Normal and High sensitivity.

Note: *High sensitivity will be better when perfusion is very low, but will also be more sensitive to noise and interference.*

- **Display Options**

  Use this panel to define how SpO2 values appear on the main screen display. See “Setting SpO2 Display Options” on page 22-11.

- **Pulse Tones**

  Use this panel to set SpO2 pulse tone and volume. See “Activating and Setting SpO2 Pulse Tones” on page 22-12.

- **Response Time**

  Use this panel to select a response time interval for updating average SpO2 and pulse rate values. See “Setting SpO2 Response Time” on page 22-14.

- **Activate**

  Use this panel to activate or deactive monitoring of SpO2. See “Activating SpO2 Monitoring” on page 22-15.

Accessing the SpO2 Menu

The **SpO2** menu can be accessed from the **Vital Signs** menu, or from the main screen display.

- ***To access the SpO2 menu from the Vital Signs menu:***

1. From Main menu select the **Vital Signs** key. The **Vital Signs** menu is displayed.
2. From the Vital Signs menu, select SpO2. The SpO2 menu appears.
3. Select the required menu item to display the associated panel.

➤ ***To access the SpO2 menu from the main screen display:***

1. When **SpO2** is displayed in a parameter slot in the primary display area (waveform area) , turn the QuicKnob™ until the **SpO2** parameter key is highlighted. The parameter key functions as an on-screen button. Press the QuicKnob™ to select the parameter key and access the **SpO2** menu.
2. When SpO2 is displayed in the Secondary Vital Sign area, or in Big Number format, turn the QuicKnob™ until the **SpO2** value is highlighted and press to select. The **SpO2** menu appears.

Setting SpO2 Alarms

SpO2 alarm parameters are set in three dialog panels: **Alarm Limits**, **Pulse Rate Alarms** and **Alarm Response**. Each dialog panel controls a different aspect of SpO2 alarms.

Setting SpO2 Alarm Limits

Use this panel to activate/deactivate and set low limit SpO2 alarms. The current low alarm limit as well as the currently measured SpO2 value are displayed on the panel. The current SpO2 saturation value is marked on the scale.

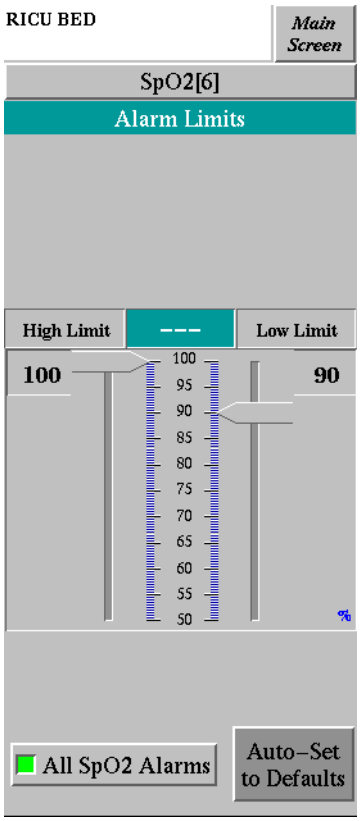


Figure 22-2: The SpO2 Alarm Limits Panel

➤ ***To set SpO2 alarm limits:***

1. From the **SpO2** menu
   –or–
   if you are already in another **SpO2** panel, from the drop-down list below the panel title area, select **Alarm Limits**.
2. Using the QuicKnob™, move the slider bar on the alarm limit slider bars along the low alarm limits scale to set the required limit. Allowed range: 85-100 (%).
   –or–
   Press **Auto-Set to Defaults** to set SpO2 alarm limits to their default values.

Note: *Factory default alarm limits for SpO2 are: Low limit = 85%; High limit = 100%. The default SpO2 alarm limits can be modified in System Setup (Password protected) within the full range of 50 % to 100 %.*

3. Press **Spo**2 to close the panel and return to the Spo2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting SpO2 Pulse Rate Alarms

Use this panel to set SpO2 pulse rate alarms.The current low and high alarm limits as well as the currently measured SpO2 pulse rate value are displayed on the panel. The current SpO2 saturation value is also marked on the scale

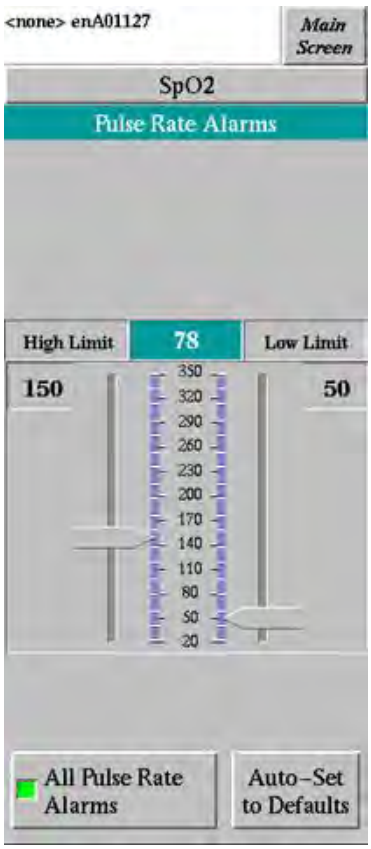


Figure 22-3: The SpO2 Pulse Rate Alarms Panel

➤ ***To set SpO2 pulse rate alarms:***

1. From the **SpO2** menu
   –or–
   if you are already in another **SpO2** panel, from the drop-down list below the panel title area, select **Pulse Rate Alarms**.

2. Select the **All Pulse Rate Alarms** checkbox to activate or deactivate all Pulse Rate alarms (When **All Pulse Rate Alarms** is deactivated, the slider bars used for setting alarm limits are disabled.).

3. Using the QuicKnob™, move the markers on the low/high alarm limits slider bars along the displayed scale to set the required limits. The right marker sets the low alarm limit and the left marker sets the high alarm limit.The allowed range is
   0–300 BPM.
   –or–
   Press **Auto-Set to Defaults** to set all Pulse Rate alarm limits to their default values.
4. Press **Spo2** to close the panel and return to the Spo2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting SpO2 Alarm Response

The **Alarm Response** panel controls how the ***Menntor X7*** responds to SpO2 alarms.

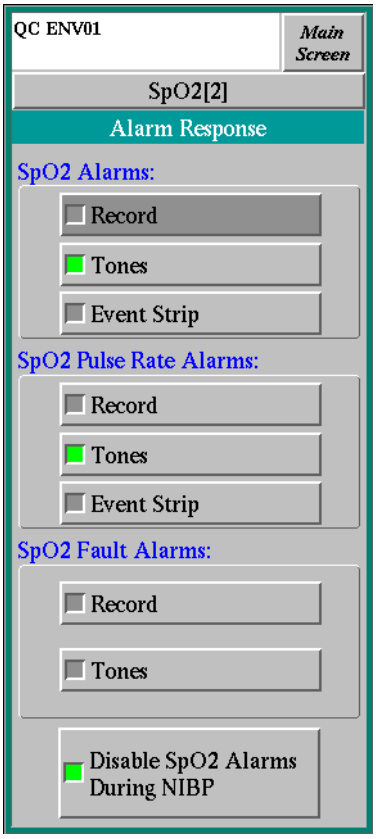


Figure 22-4: The SpO2 Alarm Response Panel

➤ ***To set SpO2 alarm response:***

1. From the **SpO2** menu
   –or–
   if you are already in another **SpO2** panel, from the drop-down list below the panel title area, select **Alarm Response**.
2. Under **SpO2 Alarms**:

- Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
- Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
- Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.

3. Repeat the above procedure to set the **SpO2 Pulse Rate** and **SpO2 Fault** alarm responses.
4. Press **Vital Signs** to close the panel and return to the Vital Signs menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *When NIBP and SPO2 are measured simultaneously on the same arm, it is recommended to disable the SPO2 alarm response by clicking the* ***Disable SPO2 Alarms during NIBP*** *button.*

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting SpO2 Display Options

The **Display Options** panel controls how SpO2 values are displayed on the main screen display. Any changes made immediately update the main screen display.

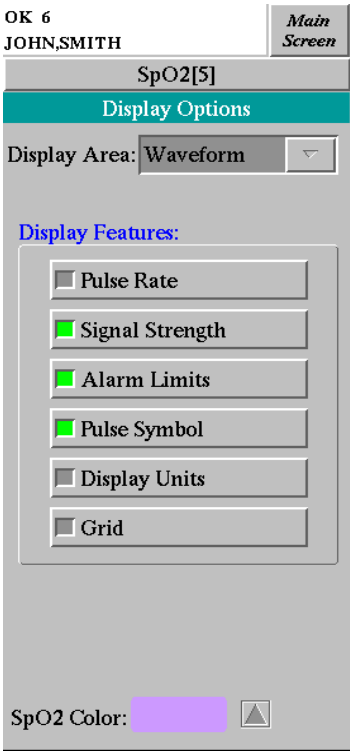


Figure 22-5: The SpO2 Display Options Panel

- ***To set SpO2 Display Options:***

1. From the **SpO2** menu
   –or–
   if you are already in another **SpO2** panel, from the drop-down list below the panel title area, select **Display Options** .
2. From the **Display Area** list, select the area on the main screen display where you want temperature to appear from the drop-down list. The available options are: **Waveform**, **Secondary VS** or **Big Numbers**. By default, SpO2 values are displayed in the **Secondary VS** area.

3. Under Display Features:

- Select the **Pulse Rate** checkbox to activate or deactivate display of SpO2 pulse rate.
- Select the **Signal Strength** checkbox to activate or deactivate display of SpO2 Waveform bar on the main screen display.

Notes: *1. The Waveform bar does not represent the signal strength or the perfusion index.*
2. Even though the Waveform bar and the SpO2 waveform are affected by pulse blood volume, they cannot be used for measurement of the pulse volume since automatic gain always brings the pulse to an optimal size for display.

- Select the **Alarm Limit** checkbox to activate or deactivate display of SpO2 alarm limits on the main screen display.
- Select the **Pulse Symbol** checkbox on or off to activate or deactivate display of the pulse symbol on the main screen display.
- Select the **Display units** checkbox to activate or deactivate display of a percentage symbol (%) next to the oxygen saturation value, which always appears on the main screen display.
- Select the **Grid** checkbox to activate or deactivate display of the SPO2 waveform on a grid. By default, the checkbox is deactivated. This option is active only if the SPO2 is displayed in the Primary Vital Sign area as a waveform.

4. Press **SpO2 Color** and , from the panel that appears, select the display color for all SpO2 values on the main screen.
5. Press **SpO2** to close the panel and return to the SPO2 menu
–or–
press **Main Screen** to close the panel and return to the main screen display.

Activating and Setting SpO2 Pulse Tones

In the **Pulse Tones** panel, you can define that the ***Menntor X7*** generate an audible tone to indicate pulse rate and saturation and set the tone's volume. There are two available options, **Pulse,** and **Pitch and Pulse.** When **Pulse** is selected, each time a pulse beat is detected, an audible tone is heard. When the **Pitch and Pulse** option is selected, the pitch of the tone varies along with Spo2 value indicating changes in saturation. As saturation decreases, the tone gets lower. By default, pulse tones are deactivated.

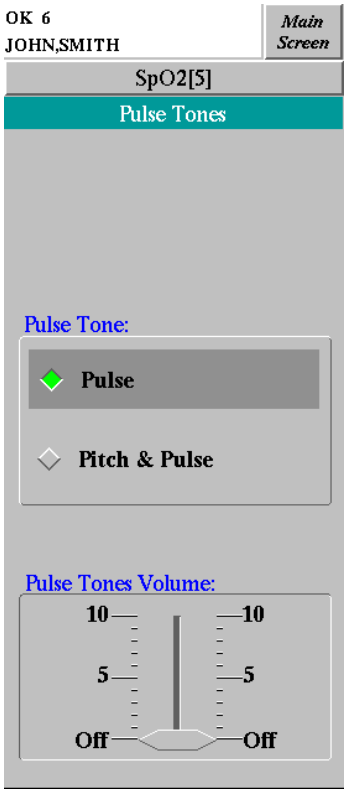


Figure 22-6: The SpO2 Pulse Tones Panel

➤ ***To activate and set pulse tones:***

1. From the **SpO2** menu
   –or–
   if you are already in another **SpO2** panel, from the drop-down list below the panel title area, select **Pulse Tones** .
2. Under **Pulse Tone**, select either **Pulse** or **Pitch and Pulse**.
3. Set pulse volume with the slider. The allowed range is **Off - 10**. When the slider is set to **Off** , SpO2 pulse tones are deactivated.
4. Press **SPO2** to close the panel and return to the SPO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting SpO2 Response Time

Select a response time interval for updating average SpO2 and pulse rate values. Available options are three (3), six (6), and twelve (12) seconds. The default response time interval is six (6) seconds.

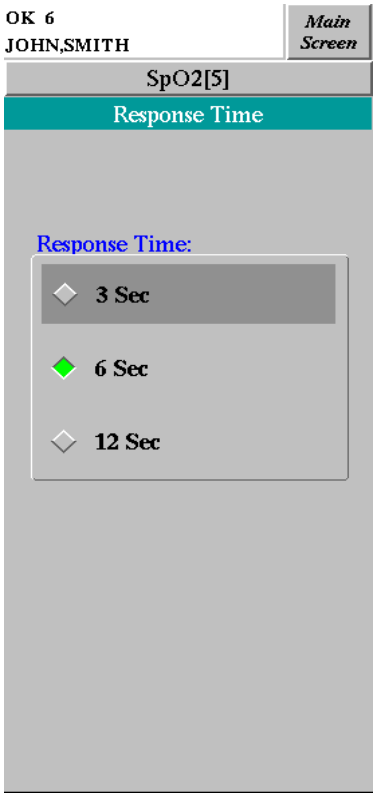


Figure 22-7: The SpO2 Response Time Panel

➤ ***To select response time:***

1. From the **SpO2** menu
   –or–
   if you are already in another SpO2 panel, from the drop-down list below the panel title area, select **Response Time**.
2. Select **3 sec**, **6 sec**, or **12 sec**.
3. Press **SPO2** to close the panel and return to the SPO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Activating SpO2 Monitoring

Use the SpO2 **Activate** panel to activate or deactivate SpO2 monitoring

➤ ***To activate or deactivate SpO2 monitoring:***

1. From the **SpO2** menu
   –or–
   if you are already in another SpO2 panel, from the drop-down list below the title area, select **Activate**.
2. Select the **Activate** checkbox to activate or deactivate SpO2 monitoring. By default, SpO2 monitoring is activated.
3. Press **SPO2** to close the panel and return to the SPO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Masimo Technology

Use only disposable transducers for neonatal SpO2 monitoring

LNCS - Neonatal Disposable Probe < 10 Kg

Recommended monitoring site:
For infants less than 3 kg: Across the foot or alternatively across the palm & back of hand. For infants greater than 3 kg: the thumb or the great toe.

LNCS – Neonatal Patient Disposable Probe < 1Kg

Recommended monitoring site:
Across the foot or alternatively across the palm and back of hand.

1. Remove liner from adhesive side.
2. Locate center line (a) and windows (b).
3. Position center line on edge of foot, hand or toe and position first window on sole of foot.
4. Wrap around foot so that windows oppose each other.
5. Wrap excess tape loosely around foot.
6. Plug into adapter cable.
7. Check site every 8 hours.

Appendix – SpO2 Sensors

Sensors for SpO2 Masimo technology:

LNCS - DCI - Adult Reusable Probe

LNCS - Adult Disposable Probe > 30 Kg

LNCS - Pediatric Disposable Probe >10 < 50 Kg

LNCS - Neonatal Disposable Probe < 10 Kg

LNCS – Neonatal Pt Disposable Probe < 1Kg

Sensors for SpO2 Nellcor technology:

SpO2 OxiMax Adapter Cable

SpO2 OxiMax Reusable, Adult Finger Sensor

Multi-Site OxiMax Dura-Y Sensor, D-YS

Ear Clip for OxiMax Dura-Y Sensor, D-YSE

Disposable OxiMax, Neonatal Foot N-25 (24/Case)

Disposable OxiMax, Infant Great Toe I-20 (24/Case)

Disposable OxiMax, Pediatric Index Finger D-20 (24/Case)

No Implied License

Possession or purchase of a monitor equipped with Masimo SpO2 does not convey any express or implied license to use the monitor with unauthorized sensors or cables which would, alone, or in combination with this monitor, fall within the scope of one or more of the patents relating to Masimo SpO2.

SpO2 Specification
Masimo SET ®

Range

Saturation (% SpO2)	1% - 100%
Pulse rate(bmp)	25 - 240
Perfusion	0.02% - 20%

Accuracy

Saturation (% SpO2) - During no Motion Condition	
Adult, Pediatric	70% - 100% +/- 2 digits
	0% - 69% unspecified
Neonatal	70% - 100% +/- 3digits
	0% - 69% unspecified
Saturation (% SpO2) - During Motion Condition	
Adult, Pediatric	70% - 100% +/- 3 digits
	0% - 69% unspecified
Neonatal	70% - 100% +/- 3digits
	0% - 69% unspecified
Pulse rate (bmp) - During no Motion Condition	
Adult, Pediatric, Neonatal	25 - 240 +/- 3digits
Pulse rate (bmp) - During Motion Condition	
Adult, Pediatric, Neonatal	25 - 240 +/- 5digits

Resolution

Saturation (% SpO2)	1%
Pulse rate(bmp)	1

Low Perfusion Performance

>0.02% Pulse Amplitude	Saturation (%SpO2) +/- 2 digits
And % Transmission > 5%	Pulse Rate +/- 3digits

Environmental

Operating Temperature	41OF to 104 OF (5OC to 40 OC)
Storage Temperature	40OF to 158 OF (-40OC to + 70 OC)
Relative Humidity	5% TO 95% non-condensing
Operating Altitude	-1,00 ft to 18,00ft (-304 m to 5,486 m)

Covidien Oximax N-65,N560, N600 and N600x

Accuracy depends on the sensor being used.

Sensor type	***SpO2 Range***	
	LoStat TM 60% to 80%	**70% to 100%**
MAX-A, MAX-AL	+/- 3	+/- 2
MAX-N(adult & neonatal)	+/- 3	+/- 2
MAX-P	+/- 3	+/- 2
MAX-I	+/- 3	+/- 2
MAX-FAST	+/- 3	+/- 2
NeoMAX		+/- 2
SC-A (Adult)		+/- 2
SC-PR (Neonatal)		+/- 2
SC-NEO (Neonatal)		+/- 2
MAX-R		+/- 3.5

Sensor type	***SpO2 Range***
OxiMax OciCliqR (Single Patient Use)	70% to 100%
OxiCliq A	+/- 2.5
OxiCliq P	+/- 2.5
OxiCliq N (Adult)	+/- 2.5
OxiCliq N (Neonatal)	+/- 2.5
OxiCliq I	+/- 2.5

OxiMax Reusable Sensor	70% to 100%
D-YS (Infant to Adult)	+/- 3
D-YS (Neonatal)	+/- 4
D-YS with D-YSE Ear Clip	+/- 3.5
D-YS with D-YSPD SpotClip	+/- 3.5
DS-100A	+/- 3
OXI-A/N (Adult)	+/- 3

Sensor type	***SpO2 Range***
OXI-A/N (Neonatal)	+/- 4
OXI-P/I	+/- 3

Total Optical Power of sensor LEDs less than 15 mW

CHAPTER 23:

END TIDAL CO2 (ETCO2)

MICROSTREAM /MICROPOD™

Overview

During respiration, oxygen is brought to the body's cells from the atmosphere. Carbon dioxide is produced by the body during cellular metabolism. It is removed from the body and expelled to the atmosphere by the cardiopulmonary system. The concentration of carbon dioxide in respiratory gas is measured to provide a noninvasive means of assessing conditions affecting cellular metabolism and the cardiopulmonary system.

Two EtCO2 options are available: Microstream plug in EtCO2 module, and MicroPod™ external EtCO2 unit connected via the UIM input.

WARNING!!! *Before making decisions on treatment of blood gas, check blood gases using a calibrated Gas Blood Analyzer. Use the monitor alarms and abnormal value as a indication for further check.*

Principles of Operation

The monitor uses Microstream non-dispersive infrared (NDIR) spectroscopy to continuously measure the amount of CO2 during every breath, the amount of CO2 present at the end of exhalation (EtCO2) and during inhalation (FiCO2), and the Respiratory Rate.

The Microstream EtCO2 circuits deliver a sample of the inhaled and exhaled gases from the ventilator circuit or directly from the patient (via an oral/nasal cannula) into the CO2 measurement sensor.

Moisture and patient secretions are extracted from the sample while maintaining the shape of the CO2 waveform.

The 50 ml/min. sampling flow rate reduces liquid and secretion accumulation, decreasing the risk of obstruction in the sample pathway in humid ICU environments.

Once inside the Microstream CO2 sensor, the gas sample goes through a microsample cell (15 microliters). This extremely small volume is quickly flushed, through an outlet tube at the back of the monitor, allowing for fast rise time and accurate CO2 readings, even at high respiration rates.

An IR source illuminates the microsample cell and the reference channel. This IR light source generates only the specific wavelengths characteristic of the CO2 absorption spectrum. Therefore, no compensations are required when different.

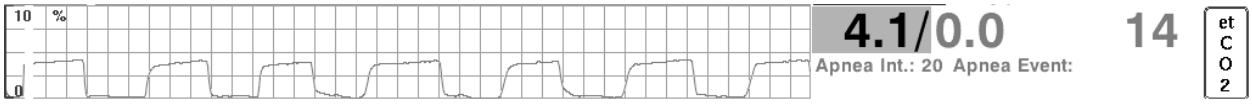


Figure 23-1: Main Screen Display of EtCO2 Waveform

CAUTION! *The End tidal CO2 is intended to represent the venous CO2 Partial Pressure.*
To achieve this goal the EtCO2 has to represent the Alveolar CO2. To get this requirement the CO2 wave has to reach a plateau.
At high respiration rates, the CO2 wave ends before the plateau is reached and the EtCO2 may not represent the alveolar CO2 or the clinical CO2.

Intended Use

The ***Menntor X7***'s End Tidal CO2 (EtCO2) Microstream, is intended for use with both intubated and non-intubated patients.

It uses real-time data to calculate and display the numerical values for End-tidal carbon dioxide (EtCO2), inspired carbon dioxide (inCO2) and Respiration Rate.

The LED indicator on the front panel of the monitor describes the functional status of the EtCO2:

Status	***Indication***
LED is green and on	EtCO2 is fully functional and monitoring
LED is red and blinking	EtCO2 is warming up
LED is red and on	Technical fault (i.e., cable connected incorrectly)

Microstream EtCO2 Circuits

FilterLine

The FilterLine has four active elements that work together to offer a solution to the problems that have previously posed challenges to capnography in ICU, emergency, and transport applications. These elements are described below.

Hydrophobic filter

The hydrophobic filter is located at the end of the sample line that is closest to the capnograph. This filter strips the remaining water vapor from the gas sample while keeping a laminar flow of the gas. This laminar flow minimizes distortion of the CO2 waveform. This filter is made of 0.45µ hydrophobic porous media that reduces biological contaminants.

Drying Element

The drying element is a tube made of a synthetic material that is chemically stable and has high water absorption. This material allows the water vapor to pass outside the tube, thereby adjusting the humidity inside the FilterLine close to the level of humidity in the ambient air.

Sample Line

The sample line has low dead space due to its small internal diameter. This provides a sharp waveform and an accurate CO2 reading at a high breath rate per minute. The sample line is not affected by gases and anesthetic agents in the operating room environment.

	Adult / Pediatric	***Infant / Neonatal***
Part Number	800-060-141	800-060-142
Patient Weight	> 2 Kg	< 2 Kg
Duration of use	Up to 72 hours	Up to 72 hours
Adapter Weight	4.5 gr	3.7 gr
Tubing Length	210 mm	210 mm
Adapter Dead space	< 6.6 cc	< 0.5 cc

FilterLine Recognition Safeguard

When the FilterLine is attached to the monitor, the FilterLine Recognition Safeguard (FRS) identifies the FilterLine and activates the monitor, thus enabling measuring.

Airway Adapter

The airway adapter design provides multiple channels for the sampled air from the airway minimizing the possibility of water infiltration or line blockage. These multiple channels allow uninterrupted monitoring for all adapter orientations and in all applications. The airway adapter provides optimal performance in all directions and is seldom disabled by secretions or liquids.

Using the MicroPod™

The MicroPod™ is an external EtCO2 unit, that can be connected to the Menntor X7 monitors via the UIM input port.

It functions the same way as the built-in Microstream, and uses the same sampling tubes.

The MicroPod™ has an interface cable that fits the UIM input.

The sampling tube input is protected by a window.

The LED on the MicroPod™ indicates the following:

- During startup the LED blinks slowly.
- During normal operation the LED remains continuously on.
- During a communication failure, malfunction, or disconnection of the MicroPod™, the LED is turned off.

Note: *The MicroPod™ can be used only on* Menntor X7 *monitors that are not equipped with a built-in EtCO2 technology.*

➤ ***To connect the MicroPod™ to the monitor***

1. Connect the MicroPod™ interface cable into one of the UIM inputs.
2. In the **Vital Signs** list select the relevant Unassigned UIM input.
3. From the UIM Device list select **MicroPod™**.

   The EtCO2 vital sign is activated.

   A technical alarm- "E**tCO2 tube Disconnected**" appears in the ETCO2 area.

➤ ***To connect the sampling tube***

1. Shift the window and screw the sampling tube into the input port.

CAUTION! *Use only Oridion sampling tube.*

CAUTION! *Secure the module to prevent it from falling. Mechanical shock may damage the module.*

Note: *It takes about 30 seconds of initialization from the connection of the MicroPod™ to the UIM till it is ready for CO2 measurement*

➤ ***To disconnect the sampling tube***

1. Shift the window and unscrew the sampling tube.

Patient Preparation Checklist

- ☐ Before using any component, inspect it for any signs of damage.
- ☐ Select and prepare a sampling tube suitable for the patient.
- ☐ Make sure that the sampling is correctly attached.
- ☐ Make sure that all connections are secure, air-tight, and that no lines are subject to tension or extreme bending
- ☐ Be sure to refer to the instructions for use provided with each accessory item to be used with the EtCO2 for specific accessory instructions.

WARNING!!! *Never allow water to enter the sampling tube. Disconnect the airway adaptor, if you use fluid for cleaning of the tracheal tube.*

Cautions and Warnings

- Note that when EtCO2 is active, Respiration from ECG is not functioning.
- Use only Mennen Medical approved airway adapters with the EtCO2.
- Single-patient (disposable) airway adapters should not be sterilized or cleaned for reuse.

Interfering Gasses

There is no interference by O_2, N_2O or NO.

Cleaning

Airway Adapter and Sampling Lines

The airway adapter and sampling lines are intended for use on a single patient and should be discarded after use. Do not attempt to clean with air or Oxygen.

WARNING!!! *Attempting to clean an airway adapter or sampling line by blowing air or Oxygen will damage the filter and may allow water to enter the module and damage the EtCO2 sensor; this damage will require costly module repair.*

Calibration

The MicroPod™ module performs auto zero automatically (typically for 10 seconds) approximately once an hour, in addition autozero occurs when corrections for changes in temperature and altitudr are required.

The MicroPod™ module requires calibration after 1200 hours from first use and then once every 4000 hours or annually, whichever comes first.

The calibration procedure is described in Chapter 5 - System Setup, of the Service manual.

Sidestream Monitoring for Intubated Patients

Airway adapter and sampling tube sets for both adult/pediatric and infant/neonatal intubated patients are available.

➤ ***To perform sidestream monitoring for intubated patients:***

1. Select the appropriate FilterLine®.
2. Slide open the FilterLine input connector shutter on the MicroPod™, and connect the appropriate FilterLine.
3. Screw the FilterLine connector into the MicroPod™ clockwise until it can no longer be turned.
4. Connect the FilterLine to the patient according to the Directions for Use supplied with the FilterLine.

Sidestream Monitoring of Non-Intubated Patients

WARNING!!! *When delivering O2 to a non-intubated patient while monitoring with the MicroPod use a Microstream sampling line with O2 tubing.*

➤ ***To perform sidestream monitoring for non-intubated patients:***

1. Check or clean the nostrils from secretion.
2. Check EtCO2 alarm limits and alarm response.
3. Attach the connector of the CO2 sampling line to the input port of the monitor.
4. Position the or oral/nasal cannula on the patient.

Intubated Sidestream Monitoring

1. Check EtCO2 alarm limits and alarm response.
2. Place the sampling tube into the patient breathing circuit.
3. Attach the connector of the CO2 sampling line to the input port of the monitor.

Monitoring Procedures

The **EtCO2** menu provides access to all the specific dialog panels enabling interaction with all aspects of EtCO2 monitoring. Each dialog panel controls different aspects of monitoring the CO_2 levels present during respiration. A short description of the panels, in the order they appear on the **EtCO2** menu, follows:

- **EtCO2 Alarm Limit**s

  Use this panel to activate/deactivate EtCO2, inCO_2 and respiration rate alarms and set high and low alarm limits. See “Setting EtCO2 Alarm Limits” on page 23-10.

- **Scale**

  Select between 0 - 50, 0 - 75, 0 - 100 mmHg

- **Display Options**

  Use this panel to define how EtCO2 values appear on the main screen display. See “Setting EtCO2 Display Options” on page 23-12.

- **Alarm Response**

  Use this panel to define how the ***Menntor X7*** responds to detected EtCO2, inCO_2, respiration rate and apnea alarms. See “Setting EtCO2 Alarm Responses” on page 23-11.

- **Adult / Neonatal**
  Select between Adult and Neonatal.

Note: *In **System Setup > Vital Sign setup > NIBP Setup** it is possible to enable, or disable changing of the patient type. The change affects all parameters. Use **Disable change** for units with a single patient type, such as **Premature Unit.***
*The selected patient type (**Adult** or **Neonatal)** appears in the top row of the display.*

- **Activate**

  Use this panel to activate or deactive monitoring of EtCO2. See “IPI” on page 23-14.

Accessing the EtCO2 Menu

The **EtCO2** menu can be accessed from the **Vital Signs** menu or from the main screen display.

➤ ***To access the EtCO2 menu from the Vital Signs menu:***

1. From Main menu select the Vital Signs key. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **EtCO2**. The **EtCO2** menu appears.

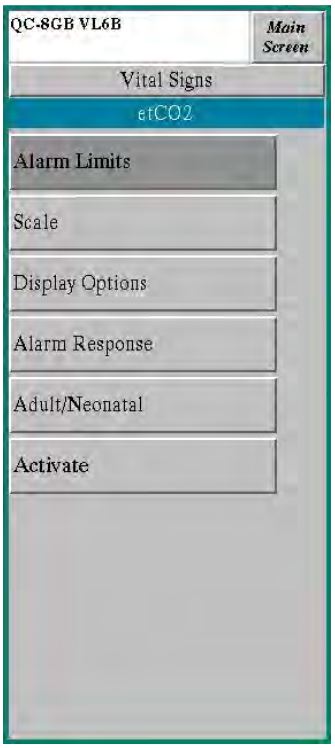


Figure 23-2: EtCO2 Menu

3. Select the required menu item to display the associated panel.

➤ ***To access the EtCO2 menu from the main screen display:***

1. When **EtCO2** is displayed in a parameter slot in the primary display area (waveform area), turn the QuicKnob™ until the **EtCO2** parameter key is highlighted. The parameter key functions as an on-screen button. Press the QuicKnob™ to select the parameter key and access the **EtCO2** menu.
2. When EtCO2 is displayed in the Secondary Vital Sign area, or in Big Number format, turn the QuicKnob™ until the **EtCO2** value is highlighted and press to select. The **EtCO2** menu appears.

Setting EtCO2 Alarms

$EtCO_2$ alarm parameters are set in two dialog panels, **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of EtCO2 alarms.

Setting EtCO2 Alarm Limits

Use this panel to activate/deactivate EtCO2, inCO_2 and respiration rate alarms and set high and low alarm limits. Selecting an option in the Select Type box activates the corresponding panel containing the current high and low alarm limits as well as the currently measured value for the selected option.

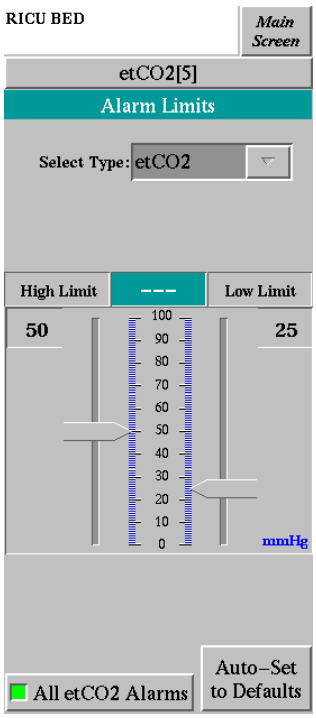


Figure 23-3: The EtCO2 Alarm Limits Panel

➤ ***To set EtCO2 alarms:***

1. From the **EtCO2** menu
   –or–
   if you are already in another **EtCO2** panel, from the drop-down list below the panel title area, select **Alarm Limits**.
2. From the **Select Type** drop-down list, select **EtCO2**, in**CO_2** or **Resp** (respiration rate) to bring up the corresponding panel.
3. Press **All inCO2/EtCO2/Resp Alarms** to activate or deactivate the alarms..
4. Using the QuicKnob™, move the slide indicator on the high limit slider bar along the alarm limits scale to set the required high limit and move the slide indicator on the low limit slider bar to set the required low limit.
   –or–
   Press **Auto-Set to Defaults** to set the EtCO2 alarm limits to their default values.

5. When you select the **Resp** option in the **Select Type** drop-down list, two additional fields appear on the dialog panel:
   - **Apnea Alarms Off**: Deactivates the Apnea alarm.
   - **Apnea Delay Interval**: Sets the apnea delay interval. If an apnea event occurs that exceeds the apnea delay interval, a message appears displaying the set interval and the time an apnea event occurred. The allowed range is 10 to 90 seconds. The default is 20 seconds.
6. Press **EtCO2** to close the panel and return to the EtCO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting EtCO2 Alarm Responses

The Alarm Response panel controls how the ***Menntor X7*** responds to EtCO2 alarms.

Figure 23-4: The EtCO2 Alarm Response Panel

➤ ***To set EtCO2 alarm responses:***

1. From the **EtCO2** menu
   –or–
   if you are already in another **EtCO2** panel, from the drop-down list below the panel title area, select **Alarm Response** .

2. Under **EtCO2 Alarm Response**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Stripis deactivated.
3. Repeat the above procedure under **inCO_2 Alarm Response**, **Resp Alarm Response** and **Apnea Alarm Response**.
4. Press **EtCO2** to close the panel and return to the EtCO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting EtCO2 Display Options

The **Display Options** panel controls how EtCO2 values are displayed on the main screen display. Any changes made immediately update the main screen display.

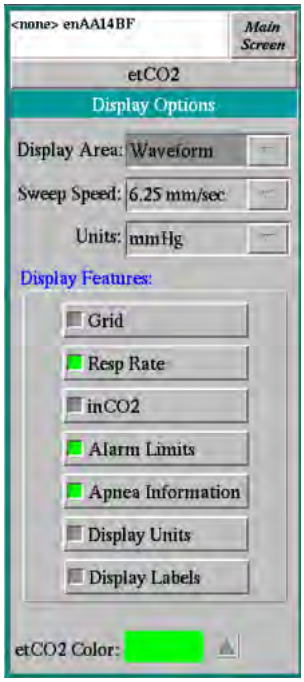


Figure 23-5: The EtCO2 Display Options Panel

➤ ***To set display options:***

1. From the **EtCO2** menu
   –or–
   if you are already in another **EtCO2** panel, from the drop-down list below the panel title area, select **Display Options** .
2. From the **Display Area** drop-down list, select the area on the main screen display where you want the EtCO2 data to appear. The available options are: **Waveform**, **Secondary VS** or **Big Numbers**. By default, EtCO2 values are displayed in the **Waveform** area**.**
3. From the **Sweep Speed** drop-down list, select the required sweep speed. Options are **ECG Sweep Speed**, **6.25 mm/sec**., **12.5 mm/sec** and **25 mm/sec**. The default sweep speed is 6.25 mm/sec.
4. Under **Display Features**:
   - Select the **Grid** checkbox to activate or deactivate display of a grid. By default, this option is activated.
   - Select the **Resp Rate** checkbox to activate or deactivate display of this value on screen. By default, this option is activated.
   - Select the **inCO_2** checkbox to activate or deactivate display of Inspired CO_2 values on screen. By default, this option is deactivated.
   - Select the **Alarm Limit** checkbox to activate or deactivate display of EtCO2 alarm limits on the main screen display.
   - Select the **Apnea Information** checkbox to activate or deactivate display of the last Apnea event and the Apnea Interval Delay on the main screen display. By default, this option is activated.
   - Select the **Display Units** checkbox to activate or deactivate display of a mmHg or percentage symbol (%) next to the EtCO2 value, which always appears on the main screen display.
   - Select the **Display Units** and **Display Labels** checkboxes to activate or deactivate display of these parameters on the main display screen. By default, these options are deactivated.
5. From the **EtCO2 Color** drop-down list, select the display color for all EtCO2 values on the main screen display. You can choose from 16 colors. The default color is green.
6. Select units: Unit can be selected between: mmHg, % and KPa

7. Press **EtCO2** to close the panel and return to the EtCO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

IPI

IPI (the Integrated Pulmonary Index™) is a numerical value which integrates four major patient parameters to provide a simple indication of the patient's overall ventilatory status. The integrated parameters are EtCO2, RR, SpO2, and PR.

Since the IPI uses data from the monitoring of both CO2 and SpO2, it is only available when both parameters are available and RR and PR are being calculated from these parameters

IPI is calculated using the current values of these four parameters and their interactions, based on known clinical data. IPI can thus provide an early indication of a change in ventilatory status which may not be shown by the current value of any of these four parameters individually. The IPI is designed to summarize information regarding patient status, possibly before EtCO2, RR, SpO2, or PR values reach levels of clinical concern.

IPI values range from 1 to 10; values should be understood according to the following table..

Table 23-1: IPI Index Values

Index	***Patient Status***
10	Normal
8-9	Within normal range
7	Close to normal range; requires attention
5-6	Requires attention and may require intervention
3-4	Requires intervention
1-2	Requires immediate intervention

WARNING!!! *Before making decisions on treatment of blood gas, check blood gases using a calibrated Blood Gas Analyzer. Use the monitor alarms and abnormal value as an indication for further check.*

IPI Age Dependence

The IPI algorithm is age dependant. It is calculated for either Adult or Neonatal.

For Neonates it is related to the age, according to the **Date of Birth** entered in the **Patient Identification** panel.

Note: *For babies less than one year old, IPI is not calculated and dashes are displayed.*

CAUTION! *If the patient is defined as Neonate and no birth date is entered, IPI assumes it is a newborn and IPI is NOT be calculated.*

IPI Monitoring Procedures

Once MicroPod™ EtCO2 is activated , IPI is automatically activated. The IPI menu provides access to all the specific dialog panels enabling interaction with all aspects of IPI monitoring. Each dialog panel controls different aspects of monitoring the IPI levels present during respiration.

Following is a short description of the panels, in the order they appear on the IPI :

- **IPI Alarm Limits**

  Use this panel to activate/deactivate IPI alarms and set low alarm limit. see “Setting IPI Alarm Limits” on page 2-16.
- **Alarm Response**

  Use this panel to define how the Menntor X7 responds to calculated IPI. see “Setting IPI Alarm Responses” on page 2-16.
- **Display Options**

  Use this panel to define how IPI values appear on the main screen display. see “Setting IPI Display Options” on page 2-17.
- **Activate**

  Use this panel to activate or deactive monitoring of IPI.

Accessing the IPI Menu

The IPI menu can be accessed from the Vital Signs menu or from the main screen display.

➤ ***To access the IPI menu from the Vital Signs menu:***

1. From **Main** menu select the **Vital Signs** key.

   The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **IPI.**

   The **IPI** menu appears.

➤ ***To access the IPI menu from the main screen display:***

1. When IPI is displayed in a parameter slot in the primary display area (Big number area), turn the QuicKnob™ until the IPI parameter key is highlighted. Select **IPI** to access the EtCO2 menu.

Setting IPI Alarm Limits

Use the Alarm Limits panel to activate/deactivate IPI alarms and set low alarm limits.

Note:

Setting IPI Alarm Responses

The **Alarm Response** panel controls how the Menntor X7 responds to IPI alarms.

➤ ***To set up IPI alarm limits:***

1. Under **IPI Alarm Response**:

   - Select the **Tones** checkbox to activate or deactivate audible alarms.

Note: *By default, Tones is activated.*

   - Select the **Event Strip** checkbox to activate or deactivate Event Strip.

Note: *By default, Event Strip is deactivated.*

Setting IPI Display Options

The **Display Options** panel controls how IPI values are displayed on the main screen display.

➤ ***To set display options:***

1. From the IPI menu select **Display Options.**

-or-

If you are already in another IPI panel, from the drop-down list below the panel title area, select **Display Options** .

2. From the **Display Area** drop-down list, select the area on the main screen display where you want the IPI data to appear. The available options are: **Secondary VS** or **Big Numbers**.

Note: *By default, IPI values are displayed in the Big Numbers area.*

3. Select the **Alarm Limit** checkbox to activate or deactivate display of IPI alarm limits on the main screen display.

Activating EtCO2 Monitoring

Use the **Activate** panel to activate or deactivate EtCO2 monitoring.

Note: *Activating EtCO2 monitoring while monitoring respiration using impedance pneumography causes the pneumograph to deactivate. The* ***Menntor X7*** *then uses EtCO2 data to monitor respiration rate.*

➤ ***To activate or deactivate EtCO2 monitoring:***

1. From the **EtCO2** menu
   –or–
   if you are already in another EtCO2 panel, from the drop-down list below the title area, select **Activate**.
2. Select the **Activate** checkbox to activate or deactivate EtCO2 monitoring. By default, EtCO2 monitoring is activated.
3. Press **EtCO2** to close the panel and return to the EtCO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Points to Consider and Possible Causes of Error

How can I get longer life from my FilterLine® H Set?

During lavage suctioning disconnect the FilterLine® or put the monitor in Standby/ Pump Off mode before starting this procedure.

in Figure 23-6: illustrates the connections from the intubated patient (endotracheal tube) to the ventilator.

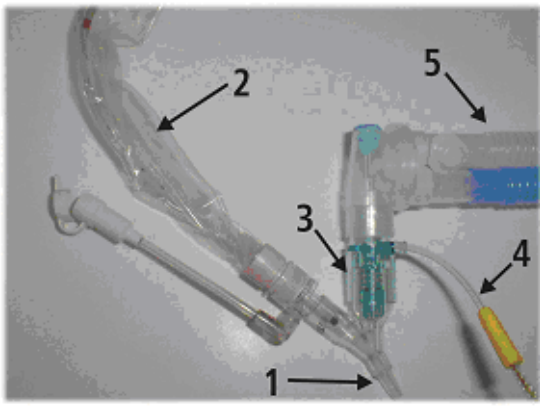


Figure 23-6: Connections from the intubated patient to the ventilator

1	To Patient
2	Inline suction
3	Airway adaptor
4	FilterLine® to capnograph
5	To Ventilator

When the patient requires suctioning by saline lavage, the position of the airway adapter is not important. Whether the airway adapter is positioned vertically or horizontally to the ET tube, some of the lavage solution will inevitably flood the airway adapter (in Figure 23-7:). To avoid the liquid entering and blocking the sample line, it is important to either disconnect the FilterLine® or place the monitor in Standby/Pump Off mode before starting this procedure.

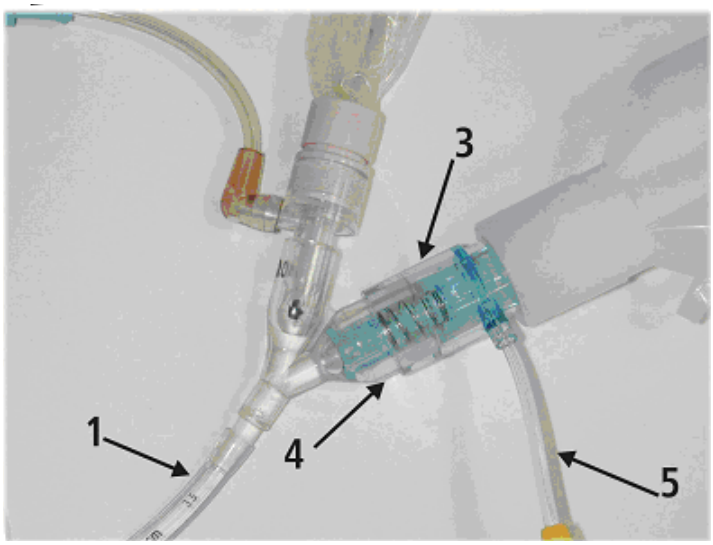


Figure 23-7: Lavage solution flooding the airway adapter

1	To Patient
2	Lavage
3	Airway adaptor
4	Liquid in airway adaptor
5	FilterLine® to capnograph

Note: *The above effect is more likely to occur with smaller ET tubes.*

How can I get longer life from my FilterLine® H Set with HME Systems?

When connecting FilterLine® Sets to an airway that includes an HME the following guidelines are recommended.

FilterLine® Sets will perform best when placed on the endotracheal hub closest to the patient (in Figure 23-8:) providing optimal rise time and accurate EtCO2 waveforms and readings.

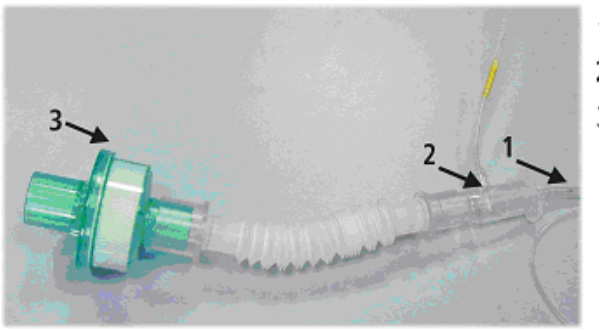


Figure 23-8: FilterLine® Sets Connections

1	To Patient
2	FilterLine® H Set
3	HME

In environments with heavy secretions, which may cause airway adapter blockage, it is best to position the airway adapter on the distal (dry side) of the HME, if long duration sampling is required (in Figure 23-9:).

Note: *In the above case, rise time may be slower by 150-300 msec, depending on the type of HME used and the length and type of tubing between the humidifier and the patient. A slower rise time will affect CO2 waveforms and readings relative to the breath rate. Fast breathing rates of over 25 bpm (usually with infants) will cause noticeably rounded waveforms and erroneously low EtCO2 readings (proportional to the breath rate).*

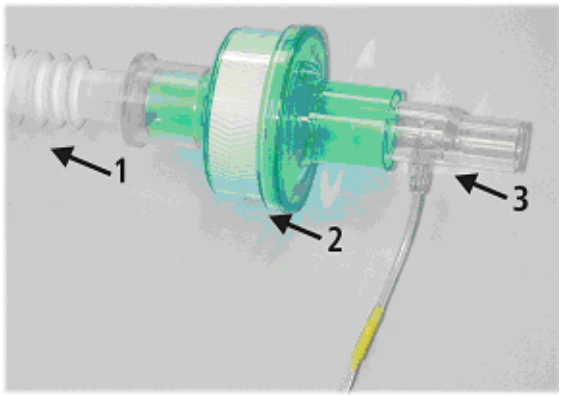


Figure 23-9: Positioning the airway adaptor in environments with heavy secretions

1	To Patient
2	HME
3	FilterLine® H Set

FAQs

Why are FilterLine® H Sets for neonates preferable to other endotracheal tube adapters, i.e. RSP adapters with side port?

The FilterLine® H set airway adapter's multiple-channel design permits it to be used in any orientation and prevents the sampling line from occluding with water or patient secretions. RSP adapters are more prone to occlusion because sampling port is located on the adapter wall.

FilterLine® H set for neonates is specially designed to fit all ET tube sizes. RSP adapters come in several different sizes for neonates and you need to stock all sizes.

For neonates that are already intubated - I'm concerned that when I want to add a sampling line using an RSP adapter, I first have to remove the hub from the ET tube and replace it with the RSP adapter. This is an uncomfortable and dangerous procedure for the child. Will I have that same problem using a FilterLine® H set?

No. The airway adapter fits easily into the ET tube hub. There is no need to disturb the patient.

Warnings and Precautions

WARNING!!! *The module should not be used as an apnea monitor.*

WARNING!!! *The use of accessories, transducers, sensors and cables other than those specified may result in increased emission and/or decreased immunity of the equipment and/or system.*

WARNING!!! *CO2 readings and respiratory rate can be affected by sensor application errors, certain ambient environmental conditions, and certain patient conditions.*

WARNING!!! *If calibration does not take place as instructed, the monitor might be out of calibration. A monitor that is out of calibration might provide inaccurate results.*

CAUTION! *To ensure accurate performance and prevent device failure, do not expose the module to extreme moisture, such as rain.*

CAUTION! *If the MicroPodTM sustains structural damage so that its internal components are visible, it should not be used.*

CAUTION! *An extension cable should not be used with either the USB version or the RS-232 version of the MicroPod™.*

CAUTION! *Exercise care when removing the MicroPod from a mount so that your finger does not get caught in the clip during removal.*

Note: *When disconnecting a sampling line from the device, hold the CO2 input connector door open while removing the sampling line, to avoid catching the sampling line on the connector door.*

Note: *During use, the MicroPod should be mounted with the CO2 connector facing upwards or to the side.*

WARNING!!! *Do not use the FilterLine H Set Infant/Neonatal during magnetic resonance imaging (MRI) scanning. Using the FilterLine H Set Infant/Neonatal during MRI scanning could harm the patient.*

CAUTION! *During MRI scanning, the module must be placed outside the MRI suite. When the module is used outside the MRI suite, EtCO2 monitoring can be implemented using the FilterLine XL.*

CAUTION! *Use of a CO2 sampling line with H in its name (indicating that it is for use in humidified environments) during MRI scanning may cause interference. The use of non H sampling lines is advised.*

CAUTION! *In high-altitude environments, EtCO2 values may be lower than values observed at sea level, as described by Dalton's law of partial pressures. When using the module in highaltitude environments, it is advisable to consider adjusting EtCO2 alarm settings accordingly.*

WARNING!!! *When using the MicroPod™ with anesthetics, nitrous oxide or high concentrations of oxygen, connect the gas outlet to a scavenger system.*

WARNING!!! *The MicroPod™ is not suitable for use in the presence of flammable anesthetic mixture with air, oxygen or nitrous oxide.*

WARNING!!! *The FilterLine may ignite in the presence of O2 when directly exposed to laser, ESU devices, or high heat. When performing head and neck procedures involving laser, electrosurgical devices or high heat, use with caution to prevent flammability of the FilterLine or surrounding surgical drapes.*

WARNING!!! *Operating high frequency electrosurgical equipment in the vicinity of the module can produce interference in the module and cause incorrect measurements.*

WARNING!!! *Do not use the module with nuclear spin tomography (MRT, NMR, NMT) as the function of the module may be disturbed.*

CAUTION! *A strong magnetic field located 1 cm or less from the MicroPod™ might temporarily affect performance of the MicroPod™.*

WARNING!!! *Do not modify this equipment without authorization of the manufacturer.*

WARNING!!! *If this equipment is modified, appropriate inspection and testing must be conducted to ensure continued safe use of the equipment.*

WARNING!!! *Loose or damaged connections may compromise ventilation or cause an inaccurate measurement of respiratory gases. Securely connect all components and check connections for leaks according to standard clinical procedures.*

WARNING!!! *Do not cut or remove any part of the sample line. Cutting the sample line could lead to erroneous readings.*

WARNING!!! *If too much moisture enters the sampling line (i.e., from ambient humidity or breathing of unusually humid air), the message* ***Clearing FilterLine*** *appears in the message area. If the sampling line cannot be cleared, the message* ***FilterLine Blockage*** *appears in the message area. Replace the sampling line once the* ***FilterLine Blockage*** *message appears.*

CAUTION! *Microstream® EtCO2 sampling lines are designed for single patient use, and are not to be reprocessed. Do not attempt to clean, disinfect, sterilize or flush any part of the sampling line as this can cause damage to the module.*

CAUTION! *Dispose of sampling lines and packaging according to standard operating procedures or local regulations for the disposal of contaminated medical waste.*

CAUTION! *Before use, carefully read the Microstream® EtCO2 sampling lines Directions for Use.*

CAUTION! *Use only Microstream® EtCO2 sampling lines to ensure the monitor functions properly.*

Note: *During nebulization or suction for Intubated patients, remove the sampling line luer connector from the module, in order to avoid moisture buildup and sampling line occlusion.*

Note: *Replace the sampling line according to hospital protocol or when a blockage is indicated by the host monitor screen. Excessive patient secretions or a build-up of liquids in the airway tubing may occlude the sampling line, requiring more frequent replacement.*

Note: *When connecting a sampling line to the module, screw the sampling line connecter clockwise into the module CO2 port until it can no longer be turned, to ensure that it is connected securely to the module. This assures that there is no leak of gases during measurement at the connection point and that measurement accuracy is not compromised.*

Note: *When the Caution message* ***Blockage!!*** *appears on the screen, indicating that the FilterLine which is attached to the module is blocked, the module's CO2 pump stops pumping the patient's breath into the module for testing. Follow the instructions that appear in the Troubleshooting section of this manual: First disconnect and reconnect the FilterLine. If the message still appears, disconnect and replace the FilterLine. Once a working FilterLine is attached to the module, the pump automatically resumes operation.*

Note: *After connecting the CO2 sampling line to the monitor and to the patient, check that CO2 values appear on the host monitor display.*

EtCO2 Specifications

Table 23-2: EtCO2 Specifications

Item	***Value***	
EtCO2 operating temperature	65 ^{O}C	
MicroPod operating temperature	40 ^{O}C	
CO2 Units	mmHg or kPa or Vol%	
CO2 resolution:	0.1mmHg.	
CO2 Waveform Resolution	0.1 mmHg	
EtCO2, FiCO2 Resolution	1 mmHg	

Table 23-2: EtCO2 Specifications

Item	***Value***	
Measurement accuracy	**CO2 Partial Pressure at sea level**	**Accuracy (see Note)**
	0-38 mmHg	± 2 mmHg
	39-99 mmHg	± (5% of reading + 0.08% x (reading –39mmHg))
	Note:*Accuracy applies for breath rates of up to 80 bpm. For breath rates above 80 bpm, accuracy is 4 mmHg or ±12 % of reading whichever is greater, for EtCO2 values exceeding 18 mmHg. This is tested according to and is compliant with ISO 21647. To achieve the specified accuracies for breath rates above 60 breaths/minute, the Microstream FilterLineH Set for Infant/Neonatal (p/n 006324) must be used. Above 55°C module temperature, ± 1mmHg or ± 2.5% (whichever is greater) has to be added to the tolerance of the accuracy specs.*	
Accuracy in the presence of interfering gases	Accuracy in the presence of interfering gases: The accuracy specification is as described below in the presence of interfering gases, as defined in the MicroPod Product Specification (Oridion document D006643).	
	0-38 mmHg: ± (2 mmHg + 4% of the expected reading in mmHg)	
	39-150 mmHg: ± (9% of expected reading in mmHg +[0.08 x (expected reading in mmHg –39mmHg)])	
Respiration Rate Range	0-150 bpm	
Waveform Sampling	20 samples/s	
Initialization Time	40 s (typical, includes power-up and initialization time)	
System Response Time	3.6 Second	
Compensation	BTPS (standard correction used by Microstream capnography during all measurement procedures for body temperature, pressure, and saturation)	

Patents

Patents covering the module should be listed in the host monitor's Operator's Manual, as follows:

"The capnography component of this product is covered by one or more of the following US patents:

6,428,483; 6,997,880; 6,437,316, 7,488,229; 7,726,954 and their foreign equivalents.

Additional patent applications pending."

SECTION 4
UNIVERSAL INPUT MODULE UIM

Two UIM connectors are available under the MX57 MPM.

Note: *The UIM inputs are only functional when the MPM is inserted into the Menntor X7.*

Menntor X7 supports interface to other vendor devices.

This section contains chapters describing relevant information for these devices.

1. Chapter 24: Multigas Anesthesia Analyzer - Andros or Poet IQ
2. Chapter 25: Anesthetic Gas Monitoring - Leon Plus
3. Chapter 26: Ventilator - Leon Plus ; Saturn EVO ; Evita, Babylog
4. Chapter 27: BIS - Bispectral Index
5. Chapter 28: CO/CCO/SvO2 - Vigilance, Vigileo, PiCCO
6. Chapter 29: Radical 7 – Masimo CO-Oximeter
7. Chapter 30: CerebraLogik- aEEG and EEG
8. Chapter 31: Train Of Four [TOF]

Vendor Device	***Interface cable P/N***
Andros 4800 Gas Analyzer	641-345-080
Drager Evita-4 ventilator	641-345-058
Leon Plus	641-345-080
PiCCO	641-345-060
Poet IQ	641-345-085
Radical 7	641- 345-058

CHAPTER 24:
MULTIGAS ANESTHESIA ANALYZER

Overview

The Menntor X7 Monitor can connect to the Mennen Medical Multigas Anesthesia Analyzer, 551-145-500, via the Anesthesia kit .

The Menntor X7 supports Anesthetic Analyzer: Model 4800 and Poet® IQ 8500AC side stream analyzers.

Note: *This is a Note*

Model 4800 Principle of Operation

Menntor X7's anesthetic agent module uses Non-Dispersive Infrared Spectroscopy (NIDS) with single beam, single detector and fully chopped ratiometric measurement with spinning gas cell.

The module uses infrared (IR) light to measure continuously the concentration of CO2, N2O and anesthetic agent in a sample respiratory gas. The O2 concentration is measured by paramagnetic O2 sensor. From these measurements the inspiratory and end tidal (end expiratory) levels of the gases are derived. Changes in gas levels are displayed graphically, and the inspired and end expiratory levels are presented numerically. CO2 is displayed in either percentages or mmHg. Other gases are given in percentages.

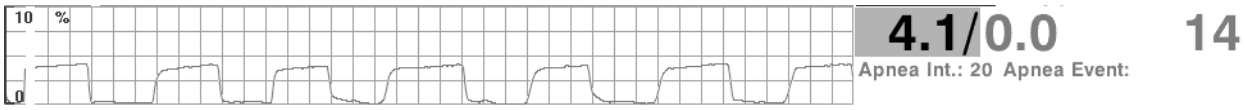


Figure 24-1: Main Screen Display of Anesthetic Agent Waveform

The module uses Sidestream monitoring, in which a tube is attached to the patient's airway circuit. Respiratory and anesthetic gases are then drawn into the tube and sent to IR and paramagnetic sensors in the measuring devices.

The unit performs automatic barometric pressure compensation to adjust the reading for changes due to pressure fluctuations. The system incorporates an internal pressure transducer that measures barometric pressure continuously.

The pressure transducer also compensates for pressure changes caused by the sampling pump. The effects of humidity are eliminated by passing the air through a water trap filter and Nafion drier.

Intended Use

The Menntor X7's anesthetic gas module is intended for use during anesthesia procedures.

The module uses real-time data to calculate and display the numerical values for end-tidal carbon dioxide ($EtCO_2$), respiration rate, inspired carbon dioxide ($inCO_2$), inspired and expired N_2O, O_2, anesthetic agent and agent identification.

Anesthetic Gas Module

The Anesthetic Gas module is a stand-alone unit connected to a UIM input on the read panel of the Menntor X7.

Patient Preparation Checklist

- ☐ Before using any component, inspect it for any signs of damage. Make sure that the interface cable is inserted into the UIM socket at the rear of the monitor.
- ☐ Select and prepare an airway adapter and sampling tube suitable for the patient.
- ☐ Make sure that all connections are secure, air-tight, and that no lines are subject to tension or extreme bending.
- ☐ Refer to the instructions for use provided with each accessory item of the anesthetic gas module for specific accessory instructions.

Cautions and Warnings

- Use only Mennen Medical approval airway adapters.
- Single-patient (disposable) airway adapters should not be sterilized or cleaned for reuse.
- Do not apply tension to the sensor connection cable.
- Do not attempt to remove the sidestream sampling chamber without first removing the watertrap.

Cleaning

Airway Adapter

The airway adapter is intended for use on a single patient and should be discarded after use. Do not reuse.

Calibration

The Anesthetic Gas module is self-calibrating and does not require pre-setup calibration. However, the Service Calibration Check should be performed to validate the unit for proper calibration approximately once every 12 months.

Zero calibration is performed automatically at intervals, depending on thermal stability. During zero calibration, measurement is temporarily deactivated for a number of seconds, and an appropriate message appears on the screen.

Recommended Anesthetic Gas Verification Procedure

The Anesthetic Gas module measures the concentration of the gases in the inspired and expired air for the following: O2, CO2, N2O, Anesthetic Agent. It also provides identification of the following five agents: Halothane, Isoflurane, Enflurane, Sevoflurane, Desflurane.

Calibration can be verified by measuring two known gas mixtures: one for zero or low level, the other for high or span value.

Zero Calibration

Zero calibration is performed automatically by the AnaGas technology, using room air as the calibration gas. No user intervention is required.

Span Verification

It is recommended to perform Span verification once a year.

Verification can be performed with the following mixture: CO2 5%, N2O 40%, Agent 3% (not Halothane), balanced with O2 52%.

Note: *Sincecalibrated gas that includes an Anesthetic agent cannot be kept in high pressure bottles, the gas mixture normally comes in small bottles that are easily used up. For this reason, it is recommended to first use a gas mixture without an Agent for routine verification. A recommended mixture is CO2 5%, N2O 40%, balanced with O2 55%. This mixture can be supplied in high pressure bottles. After performing the test with this gas mixture without an Agent, the test should then be performed with a mixture containing an Agent.*

➤ ***To perform Span Verification:***

1. Use “Pump Speed” = Adult (120 ml/min gas sampling flow).
2. Set the flow from the bottle to 150 ml/min.
3. Connect the span gas bottle to the water trap input.
4. Purge for about 30 seconds, until measurement has stabilized.
5. Compare monitor reading with calibration gas setting.
6. Turn off the span calibration gas.
7. Pump room air through the sampling gas path to clear the anesthetic gases.
8. If validation has failed call your service technician.

Gas Delivery Alternative Methods

For alternative methods to the calibration gas delivery system please contact your Mennen Medicalrepresentative.

Precautionary Environmental Considerations

- O2 and CO2 at the concentrations required for calibration are non toxic gases that can be spread in the working room.
- O2 in concentrations above 20% may be flammable: prevent contact with oil, high temperature (such as solder iron), smoking or open flame.
- Anesthetic gases should not be spread in the in-house environment. Evacuate anesthetic gases out of the building. Use large bore tube or vent.

Gas Source

Calibration Gas can be obtained from the following source: Scott Medical Products PA, USA, Tel 215-766-8861, Fax 215-766-7250.

Mixture: 1.2 liter at 15 psig of Desflurane 5%, CO2 5%, N2O 42%, Balance O2; sufficient for 8 minutes of validation

Anesthetic Gas Module

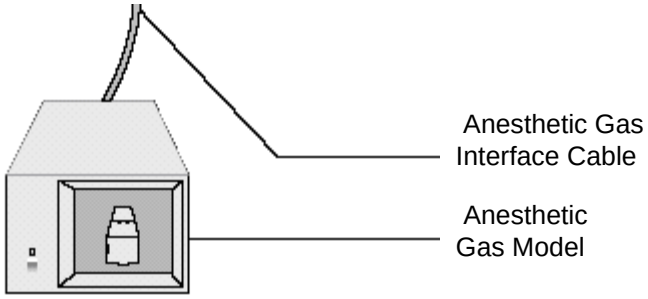


Figure 24-2: Anesthetic Gas Module Front Panel

The Anesthetic Gas Module consists of:

- Power ON switch
- Power ON LED indicator
- Water Trap Manifold

Patient Connection

➤ ***To connect a patient:***

1. 1. Power on the module, then check alarm limits and flow rate.
2. Place tee into the patient breathing circuit.
3. Attach the Lurer connector of the sampling line to the exposed end of the watertrap.
4. Attach the sampling line to the gas sampling tee.
5. Attach a scavenging system to the sidestream sampling exhaust port, if desired.

Note: *Do not use a scavenging system with a flow rate above that of the sidestream flow rate selected in the Menntor X7 of: Adult 120cc/min, Neonatal 220cc/min.*

Alarm Messages

Alarm Message	*Alarm*
High Alarm	Alarm exceed
Low Alarm	Alarm exceed
Cable Out	Cable Out condition
Apnea (+ time stamp)	Apnea detected by CO2 channel
No Comm	Communication Loss: cable disconnected or device does not transmit
CO2 Zero Calibration in Progress	Appears during zero calibration, when device is in calibration mode
CO2 4710 Error	Call Service
CO2 Error S	System Error
CO2 Error F	Fan Error
CO2 Error PS	Power Supply Error
CO2 Check Sampling Line	Sampling delivery system error
O2 Error S	Device unable to make measurement
CO2 Error S	Device unable to make measurement
N2O Error S	Device unable to make measurement
CO2 Error Agent 4750 Select Agent	Automatic agent ID not functioning, must select Agent ID manually
Zero Calibration Failure	Zero Calibration Failure
Intialize	Making communication with device
Warm-up	Warm-up waiting period

Accessories

Reference	*Item*
800-060-998	Patient sample line 7ft with Nafion Seletion (Zefon ZML - 9223)
800-060-991	Sidestream Elbow (5/Box) (Pryon)
551-145-507	Water Trap, Male Luer
551-145-505	Ventilator Fan Filter
551-145-506	Preventive Maintenance Kit

Module Specifications

Anesthesia Module	*Anesthesia Module*
Respiratory rate range: 0 to 90 breaths/min	**Response Time:** • CO2 < 350 msec • N2O < 400 msec • Oxygen < 300 msec • Halothane, Isoflurane, Enflurane, Sevoflurane, Desflurane: < 500 msec
Repiratory rate accuracy: ±2 breaths/min	**Warm-up time:** • 2 minutes to first measurement • 8 minutes to full accuracy measurement
Agent detection threshold: solitary agent 0.2%	**Complete occulsion response time:** • <5 seconds at 200 ml/min • <10 seconds at 120 ml/min
Agent Detection time: 11 sec max at 200 ml/min	**Calibration:** • User selectable automatic or manual zero calibration • Gas calibration check once per year
Sample gas flow rate: 120 or 200 ml/min	**Input Power:** • 90 to 264 Vac (48 to 62 Hz) 110 Watts typical
On screen Display • Waveforms: O2, CO2, N20 Anesthetic Agent • Derived parameters: Inspired/End Tidal values of O2, CO2, N2O, Anesthetic agent, Resp rate • Charts and Trends on all derived parameters	**Size:** • 14.5 cm H x 18.3 cm W x 43.2 cm D • 5” H x 7.2 “ W x 17 “ D • Weight 7.6 Kg (16.7 lb)
Measurement method: • CO2, N20, Anesthetic agent: NDIR (non-dispersive infrared) • O2: Paramagnetic	
Measured and identified gases: O2, CO2, N2O, Halothane, Isoflurane, Desflurane, Enflurane, Sevflurane	
Measurement Range: • CO2: 0 to 100 Torr • N2O: 0 to 100% • Oxygen: 0 to 100% • Halothane: 0.0 to 10.0% • Isolurane: 0.0 to 10.0% • Enflurane: 0.0 to 10.0% • Sevoflurane: 0.0 to 10.0% • Desflurane: 0.0 to 24%	

Anesthesia Module	*Anesthesia Module*
Measurement Accuracy: • CO2: 0 to 40 Torr ±2.5 Torr 40 to 60 Torr ±2.5 Torr 60 to 80 Torr ±4 Torr • N2O: ±1.5% abs, ±5% rel • Oxygen: ±2.5% abs, ±5% rel • Halothane: 0-7.5% ±0.2% abs, ±4% rel • Isoflurane: 0-7.5% ±0.1% abs, ±4% rel • Envlurane: 0-7.5% ±0.1% abs, ±4% rel • Sevoflurane: 0-9% ±0.1% abs, ±4% rel • Desflurane:0-20% ±0.1% abs, ±4% rel	

Preventive Maintenance

The following procedures should be performed by trained end user personnel.

1. Once a week, or as often as required, replace the water trap.
2. Once a week clean and remove any excess dust, etc. using a soft cloth, lightly moistened with water.
3. Once a year, or as often as required, clean or replace the ventilation fan filter.

Recommended Service Personnel Preventive Maintenance should be performed once a year or more often if actual usage requires it.

CHAPTER 25:
ANESTHETIC GAS MONITORING

Overview

During Anesthesia, oxygen is brought to the body's cells from the Anesthetic machine ventilator. Carbon dioxide is produced by the body during cellular metabolism. When performing anesthesia, N_2O and anesthetic agent are also delivered into the respiratory system. CO_2 is removed from the body and expelled to the atmosphere by the pulmonary system. The concentration of O_2, CO_2, N_2O and anesthetic agent are continuously monitored.

Monitoring Procedures

The Menntor X7 monitor can interface with either Andros 4800 gas module, Poet IQ or Leon Plus anesthesia machine by Heinen & Lowenstein.

The interface is accessed via the UIM in the **Vital Signs** menu which provides access to all the specific dialog panels enabling interaction with all aspects of gas monitoring. Each dialog panel controls different aspects of monitoring the gas levels present during anesthesia.

The anesthetic gas modules provide the following signals: CO_2, N_2O, Anesthetic Agent concentration, Anesthetic Agent identification (sidestream only) and O_2 signal. Each has its own dialog panel.

➤ ***To start the interface:***

1. Open the **Vital Signs** menu and select **UIM**.

This opens with the available vendor devices.

2. Select one of the vendor devices and four anesthesia dialog panels open : O2, N2O, EtCO2 and Agent.

Note: *In the case of Leon Plus a Ventilator panel also opens.*

EtCO$_2$ Monitoring

The **EtCO$_2$** menu provides access to all the specific dialog panels regarding monitoring. Description of the panels, in the order they appear on the **EtCO$_2$** menu, is given below:

- **EtCO$_2$ Alarm Limit**s

  Use this panel to activate/deactivate $EtCO_2$, $inCO_2$ and respiration rate alarms and set high and low alarm limits.

- **Alarm Response**

  Use this panel to define how the ***Menntor X7*** responds to detected $EtCO_2$, $inCO_2$, respiration rate and apnea alarms.

- **Display Options**

  Use this panel to define how $EtCO_2$ values appear on the main screen display.

- **Activate**

  Use this panel to activate or deactivate monitoring of $EtCO_2$.

- **Scale**
  Use this panel to define the way Anesthetic Agent waveforms are scaled for presentation on the main screen display.

Accessing the EtCO$_2$ Menu

The **EtCO$_2$** menu can be accessed from the **Vital Signs** menu or from the main screen display.

➤ ***To access the EtCO$_2$ menu from the Vital Signs menu:***

1. From the main menu select the **Vital Signs** key. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **EtCO$_2$**. The **EtCO$_2$** menu appears.
3. Select the required menu item to display the associated panel.

➤ ***To access the $EtCO_2$ menu from the main screen display:***

1. When **$EtCO_2$** is displayed in a parameter slot in the primary display area (waveform area), turn the QuicKnob™ until the **$EtCO_2$** parameter key is highlighted. The parameter key functions as an on-screen button. Press the QuicKnob™ to select the parameter key and access the **$EtCO_2$** menu.
2. When EtCO2 is displayed in the Secondary Vital Sign area, or in Big Number format, turn the QuicKnob™ until the **$EtCO_2$** value is highlighted and press to select. The **$EtCO_2$** menu appears.

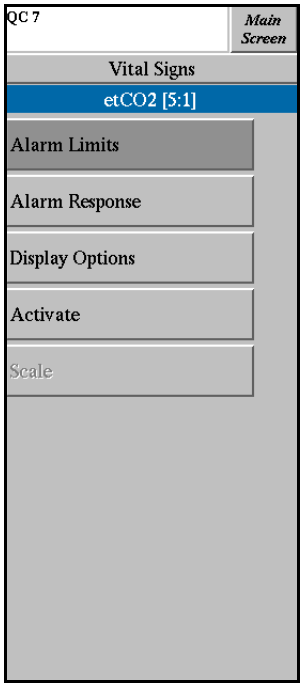


Figure 25-1: $EtCO_2$ Menu

$EtCO_2$ Alarms

$EtCO_2$ alarm parameters are set in two dialog panels, **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of $EtCO_2$ alarms.

Setting $EtCO_2$ Alarm Limits

Use this panel to activate/deactivate $EtCO_2$, $inCO_2$ and respiration rate alarms and set high and low alarm limits. Selecting an option in the Select Type box activates the corresponding panel containing the current high and low alarm limits as well as the currently measured value for the selected option.

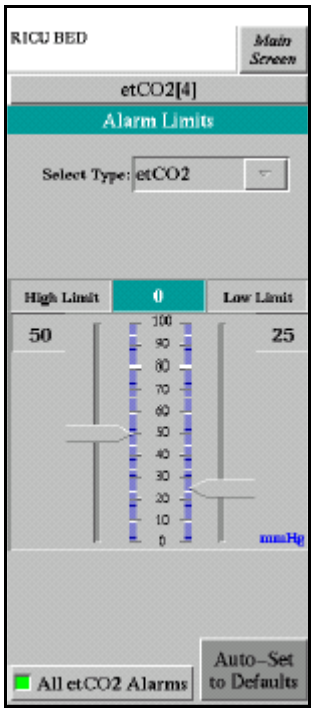


Figure 25-2: The $EtCO_2$ Alarm Limits Panel

➤ ***To set $EtCO_2$ alarms:***

1. From the **$EtCO_2$** menu
   –or–
   if you are already in another **$EtCO_2$** panel, from the drop-down list below the panel title area, select **Alarm Limits**.
2. From the **Select Type** drop-down list, select **$EtCO_2$**, **$inCO_2$** or **Resp** (respiration rate) to bring up the corresponding panel.
3. Press **All inCO2 / EtCO2 / Resp Alarms** to activate or deactivate the alarms. .
4. Using the QuicKnob™, move the slide indicator on the high limit slider bar along the alarm limits scale to set the required high limit and move the slide indicator on the low limit slider bar to set the required low limit.
   –or–
   Press **Auto-Set to Defaults** to set the $EtCO_2$ alarm limits to their default values.
5. When you select the **Resp** option in the **Select Type** drop-down list, two additional fields appear on the dialog panel:
   - **Apnea Alarms Off**: Deactivates the Apnea alarm.

- **Apnea Delay Interval**: Sets the apnea delay interval. If an apnea event occurs that exceeds the apnea delay interval, a message appears displaying the set interval and the time an apnea event occurred. The allowed range is 10 to 90 seconds. The default is 20 seconds.

6. Press **EtCO2** to close the panel and return to the EtCO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting $EtCO_2$ Alarm Responses

The Alarm Response panel controls how the ***Menntor X7*** responds to $EtCO_2$ alarms.

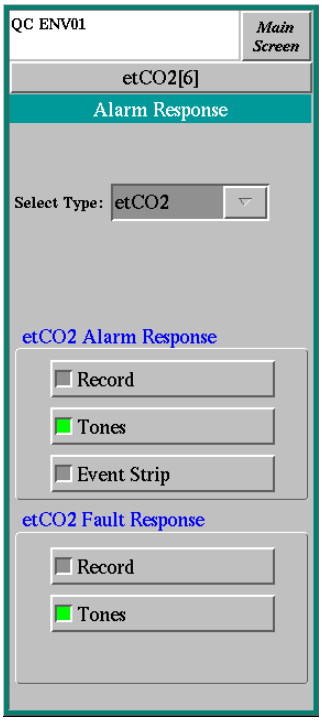


Figure 25-3: The $EtCO_2$ Alarm Response Panel

➤ ***To set $EtCO_2$ alarm responses:***

1. From the **$EtCO_2$** menu
   –or–
   if you are already in another **$EtCO_2$** panel, from the drop-down list below the panel title area, select **Alarm Response**.

2. Under **$EtCO_2$ Alarm Response**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.
3. Repeat the above procedure under **$inCO_2$ Alarm Response**, **Resp Alarm Response** and **Apnea Alarm Response**.
4. Press **Vital Signs** to close the panel and return to the **Vital Signs** menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting $EtCO_2$ Display Options

The **Display Options** panel controls how $EtCO_2$ values are displayed on the main screen display. Any changes made immediately update the main screen display.

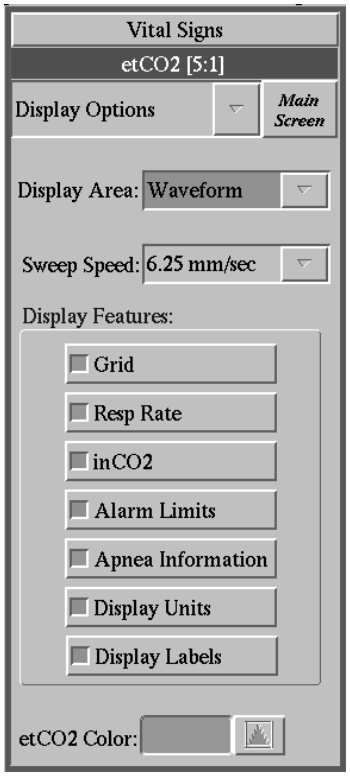


Figure 25-4: The $EtCO_2$ Display Options Panel

➤ ***To set display options:***

1. From the **$EtCO_2$** menu
   –or–
   if you are already in another **$EtCO_2$** panel, from the drop-down list below the panel title area, select **Display Options**.
2. From the **Display Area** drop-down list, select the area on the main screen display where you want the $EtCO_2$ data to appear. The available options are: **Waveform**, **Secondary VS** or **Big Numbers**. By default, $EtCO_2$ values are displayed in the **Waveform** area**.**
3. From the **Sweep Speed** drop-down list, select the required sweep speed. Options are **ECG Sweep Speed**, **6.25 mm/sec**, **12.5 mm/sec** and **25 mm/sec**. The default sweep speed is 6.25 mm/sec.
4. Under **Display Features**:
   - Select the **Grid** checkbox to activate or deactivate display of a grid. By default, this option is activated.
   - Select the **Resp Rate** checkbox to activate or deactivate display of this value on screen. By default, this option is activated.
   - Select the **$inCO_2$** checkbox to activate or deactivate display of Inspired CO_2 values on screen. By default, this option is deactivated.
   - Select the **Alarm Limit** checkbox to activate or deactivate display of $EtCO_2$ alarm limits on the main screen display.
   - Select the **Apnea Information** checkbox to activate or deactivate display of the last Apnea event and the Apnea Interval Delay on the main screen display. By default, this option is activated.
   - Select the **Display Units** checkbox to activate or deactivate display of a mmHg or percentage symbol (%) next to the $EtCO_2$ value, which always appears on the main screen display.
   - Select the **Display Units** and **Display Labels** checkboxes to activate or deactivate display of these parameters on the main display screen. By default, these options are deactivated.
5. From the **$EtCO_2$ Color** drop-down list, select the display color for all $EtCO_2$ values on the main screen display. You can choose from 16 colors. The default color is green.
6. Press **EtCO2** to close the panel and return to the EtCO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting the Scale

The **Scale** dialog panel defines the way $EtCO_2$ waveforms are scaled for presentation on the main screen display.

You can set the scale in mmHg units, or in percentages.

For mmHg, three scales are available:

- 0 - 50 mmHg
- 0 - 75 mmHg
- 0 - 100 mmHg

For percentages, three scales are available:

- 0 - 6%
- 0 - 10%
- 0 - 15%

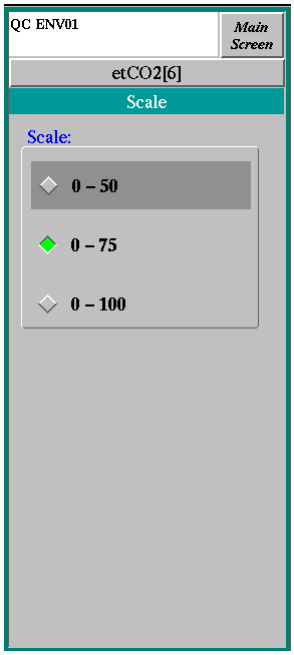


Figure 25-5: $EtCO_2$ Scale Panel

➤ ***To scale $EtCO_2$ waveform:***

1. From the **$EtCO_2$** menu, choose **Scale**.
2. Select the required values.
3. Press **Vital Signs** to return to the **Vital Signs** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Activating $EtCO_2$ Monitoring

Use the **Activate** panel to activate or deactivate $EtCO_2$ monitoring.

Note: *Activating $EtCO_2$ monitoring while monitoring respiration using impedance pneumography causes the impedance pneumography to deactivate. The* **Menntor X7** *then uses $EtCO_2$ data to monitor respiration rate.*

➤ ***To activate or deactivate $EtCO_2$ monitoring:***

1. From the **$EtCO_2$** menu
   –or–
   if you are already in another $EtCO_2$ panel, from the drop-down list below the title area, select **Activate**.
2. Select the **Activate** checkbox to activate or deactivate $EtCO_2$ monitoring.
3. Press **EtCO2** to close the panel and return to the EtCO2 menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

O_2, N_2O, and Anesthetic Agent Monitoring Procedures

The O_2, N_2O, and Anesthetic Agent menus provide access to all the specific dialog panels, enabling interaction with all aspects of O_2, N_2O, and Agent monitoring. Each dialog panel controls different aspects of monitoring of O_2, N_2O and Agent levels present during anesthesia.

Five anesthetic agents are available:

- Haloten (HAL)
- Isoflurane (ISO)
- Enflurane (ENF)
- Sevoflurane (SEV)
- Desflurane (DES)

Note: *The term **Agent** refers to all agents.*

The folowing panels appear in the O_2, N_2O, and Agent menus:

- **Alarm Limits**
  Use these panels to activate/deactivate etO_2, etN_2O, etAgent, inO_2, inN_2O, inAgent, and set the high and low alarms limits.

- **Alarm Response**
  Use these panels to define how the ***Menntor X7*** responds to detected etO_2, inO_2, etN_2O, inN_2O, exAgent, inAgent alarms.
- **Display Options**
  Use these panels to define how O_2, N_2O and Agent values appear on the main screen display.
- **Scale**
  Use this panel to define the way Anesthetic Agent waveforms are scaled for presentation on the main screen display.
- **Activate**
  Use these panels to activate or deactivate monitoring of O_2, N_2O and agent.

Note: *Although O_2, N_2O, and the Anesthetic Agenst have their own menus and dialog panels, the menus and panels are identical (except for the **Activate** panel). For this reason a single procedure is given below for O_2, however the procedure is identical for N_2O and the Anesthetic Agents, unless otherwise noted.*

Accessing the O_2, N_2O and Anesthetic Agent Menu

The O_2, N_2O and Agent menus can be accessed from the **Vital Signs** menu or from the main screen display.

➤ ***To access the O_2, N_2O and Agent menus from the Vital Signs menus:***

1. From the main menu select the **Vital Signs**key. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select O_2, N_2O, or the required Agent. The appropriate menu appears.
3. Select the required menu item to display the associated panel.

➤ ***To access the O_2, N_2O and Agent menus from the main screen display:***

1. When O_2, N_2O or an Agent is displayed in a parameter slot in the primary display area (waveform area), turn the QuicKnob™ until the required parameter key is highlighted. The parameter key functions as an on-screen button. Press the QuicKnob™ to select the parameter key and access the required menu.
2. When O_2, N_2O or an Agent is displayed in the Secondary Vital Sign area, or in Big Number format, turn the QuicKnob™ until the required value is highlighted and press to select. The appropriate menu appears.

Setting O_2, N_2O and Anesthetic Agent Alarms

O_2, N_2O and Agent alarm parameters are set in two dialog panels, **Alarm Limits** and **Alarm Response**. Alarm Limits allows you to activate/deactivate etO_2, inO_2, etN_2O, inN_2O, etAgent, inAgent alarms, and set high and low alarm limits. Alarm Response allows you to define how the ***Menntor X7*** responds to detected etO_2, inO_2, etN_2O, inN_2O, etAgent, inAgent alarms.

Setting O_2, N_2O and Agent Alarm Limits

Use this panel to activate/deactivate etO_2, inO_2, etN_2O, inN_2O, etAgent, inAgent alarms, and set high and low alarm limits. Selecting an option in the Select Type box activates the corresponding panel containing the current high and low alarm limits as well as the currently measured value for the selected option.

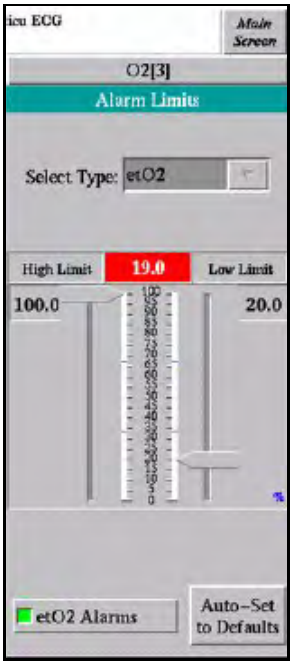


Figure 25-6: The O_2 Alarm Limits Panel

➤ ***To set O_2, N_2O and Agent alarms:***

1. From the O_2, N_2O or Agent menu

   –or–

   if you are already in a O_2, N_2O or Agent panel, from the drop-down list below the panel title area, select **Alarm Limits**.

2. From the **Select Type** drop-down list, select etO_2, inO_2, or etN_2O, inN_2O, or etAgent, inAgent to bring up the corresponding panel.

3. Press **O2/N2O/Agent Alarms** to activate or deactivate alarms..
4. Using the QuicKnob™, move the slide indicator on the high limit slider bar along the alarm limits scale to set the required high limit and move the slide indicator on the low limit slider bar to set the required low limit.
   –or–
   Press **Auto-Set to Defaults** to set the O_2, N_2O or Agent alarm limits to their default values.
5. Press **Gas Name (O2, N2O or Agent)** to close the panel and return to the Gas Name menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting O_2, N_2O or Agent Alarm Response

The Alarm Response panel controls how the ***Menntor X7*** responds to etO_2, inO_2, etN_2O, inN_2O, etAgent, inAgent alarms.

Figure 25-7: The EtO_2 Alarm Response Panel

➤ ***To set O_2, N_2O or Agent alarm responses:***

1. From the O_2, N_2O or Agent menu
   –or–
   if you are already in another O_2, N_2O or Agent panel, from the drop-down list below the panel title area, select **Alarm Response**.

2. Under **etO_2/etN_2O/etAgent Alarm Response:**

   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, Tones is activated.
   - Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.

3. Repeat the above procedure under **inO_2/inN_2O/inAgent Alarm Response**, **Resp Alarm Response** and **Apnea Alarm Response**.

4. Press **Gas Name (O_2, N_2O or Agent)** to close the panel and return to the Gas Name menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Setting O_2, N_2O and Anesthetic Agent Display Options

The **Display Options** panel controls how O_2, N_2O and Agent values are displayed on the main screen display. Any changes made immediately update the main screen display.

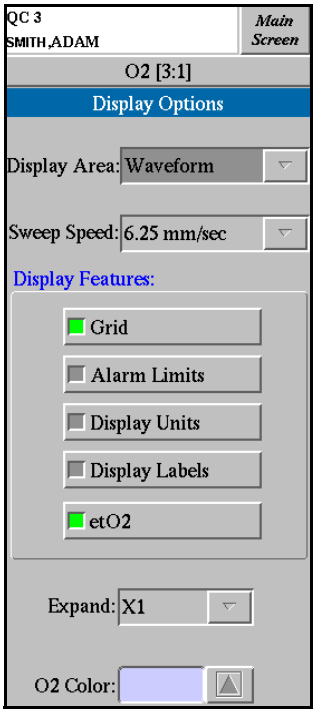


Figure 25-8: The O_2 Display Options Panel

➤ ***To set display options:***

1. From the **O_2, N_2O** or **Agent** menus
   –or–
   if you are already in another O_2, N_2O or Agent panel, from the drop-down list below the panel title area, select **Display Options**.
2. From the **Display Area** drop-down list, select the area on the main screen display where you want the O_2, N_2O or Agent data to appear. The available options are: **Waveform**, **Secondary VS** or **Big Numbers**. By default, the values are displayed in the **Big Numbers** area**.**
3. From the **Sweep Speed** drop-down list, select the required sweep speed. Options are **ECG Sweep Speed**, **6.25 mm/sec**, **12.5 mm/sec** and **25 mm/sec**. The default sweep speed is 6.25 mm/sec.
4. Under **Display Features**:
   - Select the **Grid** checkbox to activate or deactivate display of a grid. By default, this option is activated.
   - Select the **Alarm Limit** checkbox to activate or deactivate display of O_2, N_2O or Agent alarm limits on the main screen display.
   - Select the **Display Units** and **Display Labels** checkboxes to activate or deactivate display of these parameters on the main display screen. By default, these options are deactivated.
   - Select the **etO_2/etN_2O/etAgent** checkbox to activate or deactivate display of end tidal O_2, N_2O or Agent values on screen.
5. From the O_2, N_2O or Agent Color drop-down list, select the display color for O_2/N_2O/Agent values on the main screen display. You can choose from 16 colors.
6. Press **Gas Name (O_2, N_2O or Agent)** to close the panel and return to the Gas Name menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Selecting the O_2, N_2O and Anesthetic Agent Scale

The **Scale** dialog panel defines the way O_2, N_2O and Anesthetic Agent waveforms are scaled for presentation on the main screen display.

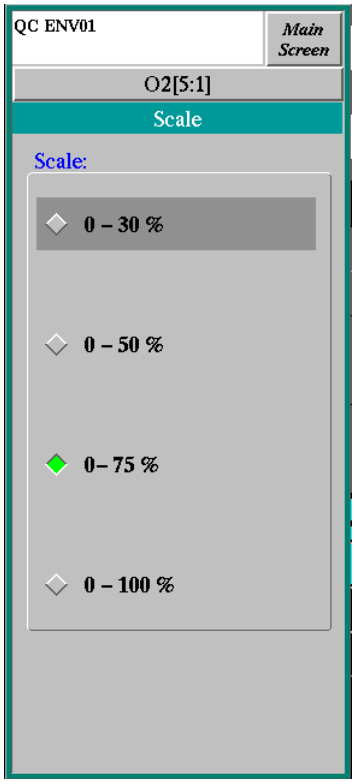


Figure 25-9: The O_2 Scale Dialog Panel

➤ ***To scale the O_2, N_2O and Anesthetic Agent waveform:***

1. From the O_2, N_2O or Agent menu, select **Scale**.
2. Select the required values.
3. Press **Vital Signs** to return to the **Vital Signs** menu,
   –or–
   Press **Main Screen** to return to the main screen display.

Activating Monitoring

Use the **Activate** panel to activate or deactivate O_2, N_2O and Anesthetic Agent monitoring.

Activating O2 and N2O Monitoring

➤ ***To activate or deactivate O_2, N_2O monitoring:***

1. From the O_2, N_2O or Agent menus
   –or–
   if you are already in another O_2, N_2O or Agent panel, from the drop-down list below the title area, select **Activate**. The **Activate** panel opens.
2. Select the **Activate** checkbox to activate O_2 or N_2O monitoring. By default, O_2 and N_2O Agent monitoring is activated.
3. Press **Gas Name (O_2, N_2O or Agent)** to close the panel and return to the Gas Name menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

Activating Anesthetic Agent Monitoring

You can instruct the ***Menntor X7*** to begin monitoring only when it detects the agent. Once the agent is detected, its name appears in Agent menu.

➤ ***To activate or deactivate Agent monitoring:***

1. From the Agent menu
   –or–
   if you are already in another Agent panel, from the drop-down list below the title area, select **Activate**. The **Activate** panel opens.
2. Select the **Activate** checkbox to activate Agent monitoring.

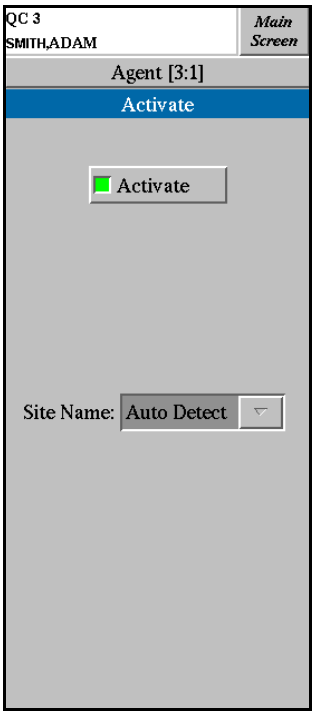


Figure 25-10: Agent Activate Panel

3. Press **Gas Name (O_2, N_2O or Agent)** to close the panel and return to the Gas Name menu
   –or–
   press **Main Screen** to close the panel and return to the main screen display.

MAC (Minimum Alveolar Concentration)

The Minimum Alveolar Concentration (MAC) is the alveolar concentration of an inhaled anesthetic at one atmosphere that prevents skeletal muscle movement in response to a noxious (pain) stimulus in 50% of patients.

MAC represents a relative measure of depth of anesthesia.

It can be used to compare inhaled anesthetics and is a useful index of anesthetic potency.

Approximately 1.3 MAC prevents skeletal muscle movement in nearly all patients during surgery.

The MAC is Calculated by the Formula:

$$MAC(AA) = \frac{\%\ Ex(AA)}{x(AA)} + \frac{\%\ EtN20}{100}$$

Where x (AA) is a parameter defined in the System Setup of Vital Signs, for "Agent Setup"

With the following default values:

x(AA): Hal = 0.75%, Enf = 1.7%, Iso = 1.15%, Sev = 2.05% and Des = 6.0%

The parameters can be changed by entering the System Setup (password protected).

MAC value is displayed in the N2O and Anesthetic Agent big numbers area

MAC Calculation example:

Ex (Hal) = 1.2 % , EtN2O = 60 %

MAC = 1.2 / 0.75 + 60 / 100 = 2.2

CHAPTER 26: VENTILATOR

Overview

The Menntor X7 Patient Monitor connects to the auxiliary Ventilator device via the Uniport Input (UIM) on the back panel of the Menntor X7 monitor. The UIM plugs are equipped with a serial data input for receiving patient data and waveform information from the ventilator device for direct display by the Menntor X7 Monitor. The Menntor X7 is able to display data from the ventilator, including status and technical alarm messages. Adjustment of alarms limits on the vital signs is also available. The values are memorized in Charts and Trends and are sent to reports. These values may also be used to perform various calculations.

The data and alarm messages are transmitted to the central stations through the network.

•

Note: *The display by the Menntor X7 Patient Monitor of an Auxiliary Device function should be regarded as secondary duplication of the functions. This secondary duplication should be used for user convenience in comparing data and registering events for data management purposes. The* Menntor X7 *monitor should not be considered the primary monitoring display for the Auxiliary Device. The Auxiliary Device should always be considered the primary monitoring source. In the event of a discrepancy between the Auxiliary Device and the Menntor X7 monitor, the Auxiliary Device always takes priority.*

Note: *Menntor X7 auxiliary ventilators supported are:*

- *Drager Evita ventilator*
- *Leon Plus by Heinen & Lowenstein*
- *Ventilator Saturn EVO by MEDEC*
- *Stephanie Ventilator by Stephan*
- *Babylog VN 500 ventilator by Drager*

Ventilator Parameters

Depending on the Ventilator device in use, the parameters that maybe selected include:

• Respiration Rate - total and spontaneous	RR t/s
• Minute Volume - total and spontaneous	MV t/s
• Tidal Volume - total and spontaneous	VT t/s
• Peak Inspiration Pressure/Mean Airway Pressure	PIP/MAP
• Positive End Expiratory Pressure	PEEP, Auto PEEP
• Compliance - Static and Dynamic	COMP St/Dy
• Resistance - Static and Dynamic	RES St/Dy
• I:E Ratio	I : E
• Plateau Pressure	PLTP
• Negative Inspiratory Pressure	NIP
• Fractional and Inspiratory O2	FiO2
• Oscillatory pressure (Stephanie only)	Posc
• Airway temperature (Stephanie only)	TEMP
• Rapid Shallow Breathing Index(Babylog only)	RSB
• Tidal Volume for High Frequency Ventilation (Babylog only)	VThf

Note: *Not every ventilator covers all the derived parameters.*

Monitoring Procedures

- The Ventilator menu provides access to dialog panels which enablinVThf

g interaction with all aspects of Ventilator monitoring. The following dialog panels are available:

- **Alarm Limits**

  Use this panel to activate/deactivate Ventilator alarms and define Ventilator alarm limits.

- **Alarm Response**

Use this panel to define alarm response by tone or recording.

- **Display Options**

  Use this panel to define how Ventilator values appear on the main screen display.

- **Activate**

  Use this panel to activate/deactivate Ventilator monitoring.

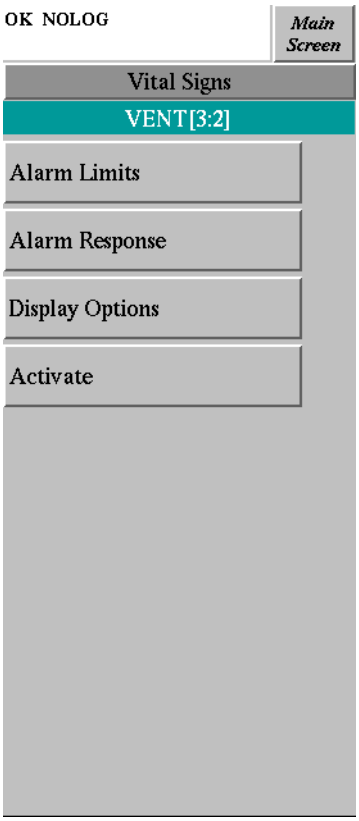


Figure 26-1: Ventilator Vital Signs Menu Selection

Ventilator Menu

The **Ventilator** menu can be accessed from the **Vital Signs** menu or from the main screen display.

➤ ***To access the Ventilator panel from the Vital Signs menu:***

1. From the main menu select Vital Signs. The UIM module key will appear All the devices that the Menntor X7 can be currently connected to will appear on the **Vital Signs** menu..
2. Select the UIM and press the QuickKey.

3. A list of all available auxiliary device communication software will appear, including ventilators supported by the Menntor X7.
4. From the **Vital Signs** menu, select the Ventilator device that you wish to connect to the Menntor X7. The appropriate menu is displayed.

➤ ***To access the Ventilator panel from the main screen display:***

1. Turn the QuicKnob™ until the Ventilator parameter key is highlighted and press to access the Ventilator panel.

Setting Alarms

Ventilator alarm parameters are set in two dialog panels: **Alarm Limits** and **Alarm Response**. Each dialog panel controls a different aspect of Ventilator alarms.

Note: *The alarm limit settings should always be set and monitored in the Auxiliary device as the primary setting for the alarms.*

Setting Ventilator Alarm Limits

The **Alarm Limits** dialog panel controls activation and deactivation of Ventilator alarms and defines Ventilator alarm limits. Low and high alarm limits are set separately for each parameter selected.

The Ventilator Module detects alarms and notifies the Menntor X7 accordingly to display the appropriate message.

By configuring parameters on this panel you can:

- Activate or deactivate all Ventilator alarms.
- Set low and high Ventilator alarms.
- Set low and high Ventilator alarms to default values.

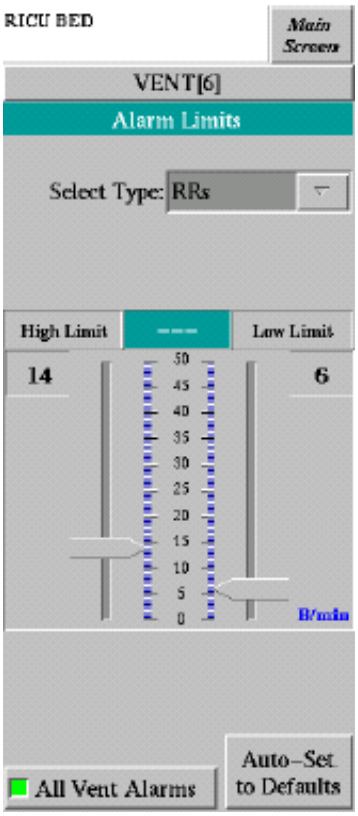


Figure 26-2: Ventilator Alarm Limits Panel

➤ ***To set Ventilator alarm limits:***

1. From the **Ventilator** menu, select **Alarm Limits**.
2. From the **Select Type** drop-down list, select the type of Ventilator parameter for which you want to set alarm limits.
3. Select the **All Alarms** checkbox to activate or deactivate both high and low limit alarms. When deactivated, alarm detection is disabled and the slider is disabled.
4. Using the QuicKnob™, set the left marker on the slider bar to the required high alarm limit for the current Ventilator parameter, then set the right marker to the required low alarm limit. These limits are displayed in the High and Low Limit value areas on the panel.
   –or–
   Press **Auto Set to Defaults** to automatically set alarm limits to default values.
5. Press **Main Screen** to return to the main screen display.

Setting Ventilator Alarm Response

The **Alarm Response** panel controls the way the Menntor X7 responds to Ventilator alarms for each parameter type.

The panel is divided into three areas:

- Parameter **Type selection**, where the parameter to be set is selected.
- **Alarms**, where response preferences are set for clinical alarms
- **Fault**, where preferences are set for technical alarms.

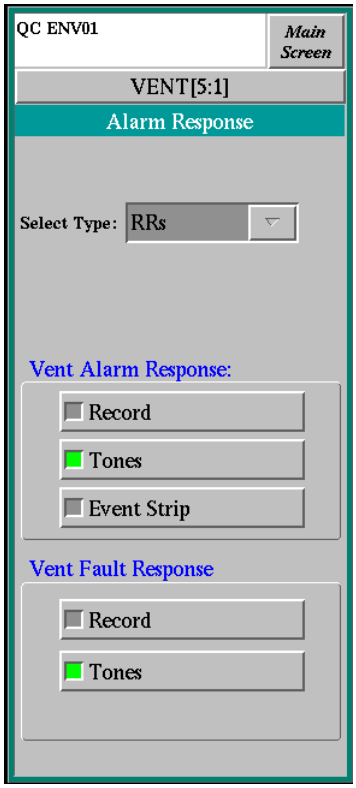


Figure 26-3: The Ventilator Alarm Response Dialog Panel

➤ ***To set alarm response preferences:***

1. From the **Ventilator** menu select **Alarm Response**. The **Alarm Response** panel appears. Under Parameter **Type Selection**, choose the parameter to be set.
2. Under **Ventilator Alarms**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, Record is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By

default, Tones is activated.

- Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, Event Strip is deactivated.

3. Under **Ventilator Fault**:
   - Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.
   - Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
4. Press **Main Screen** to return to the main screen display.

Setting Ventilator Display Options

The **Ventilator Display Options** panel enables you to control the way Ventilator values appear on the main screen display. You can set the display to suit the hospital's or department's particular needs. Any changes made are immediately reflected on screen.

By setting the parameters on the **Display Options** panel you can:

- Select **Cell Size** to instruct the monitor to display Ventilator information in the as **Quarter**, **Half** or **Full** size.
- Define the color of Ventilator values as they are displayed on the screen. All values and associated parameters have the same color unless they go into alarm, in which case the value takes on the alarm priority color. When the alarm condition terminates, the original color is restored.
- Select the cells to be displayed. By default, all ventilator parameters will be displayed.

➤ ***To set Ventilator Display Options:***

1. From the **Ventilator** menu select **Display Options**. The **Display Options** panel opens.
2. From the **Display Options** panel, select the parameters you wish to display and press **Done.**

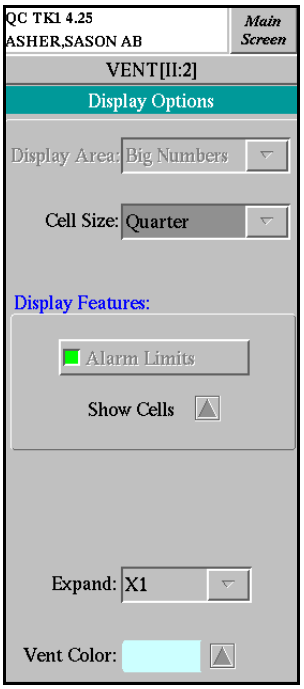


Figure 26-4: Ventilator Display Options

3. From the **Cell Size**, select the size of the data display numbers. The Ventilator data is displayed on the lower part of the displayed on screen. The options are: **Quarter, Half** and **Full. Numbers**.
4. From the **Vent Color** list, select the color required for Ventilator parameters. You have a choice of 16 colors.
5. Press **Main Screen** to return to the main screen display.

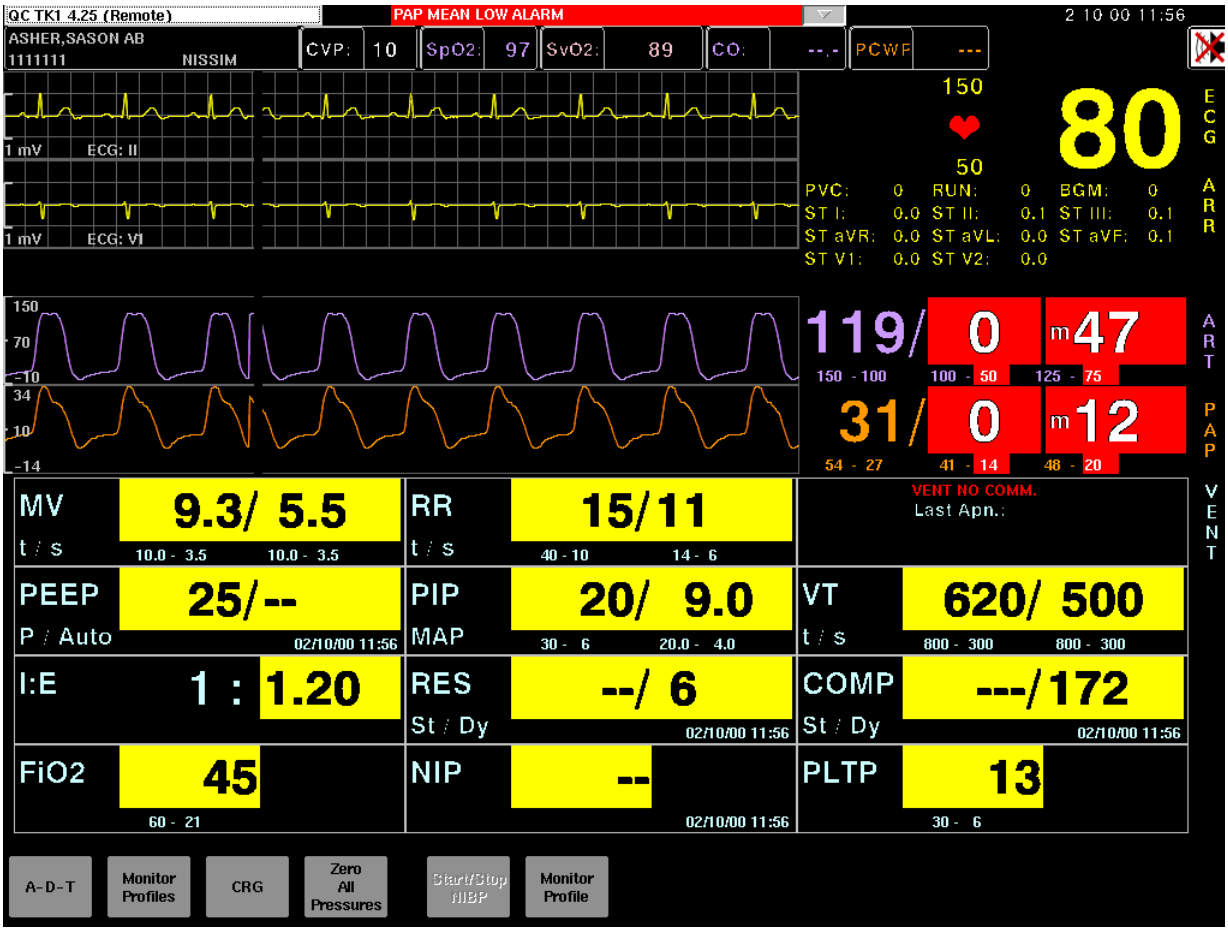
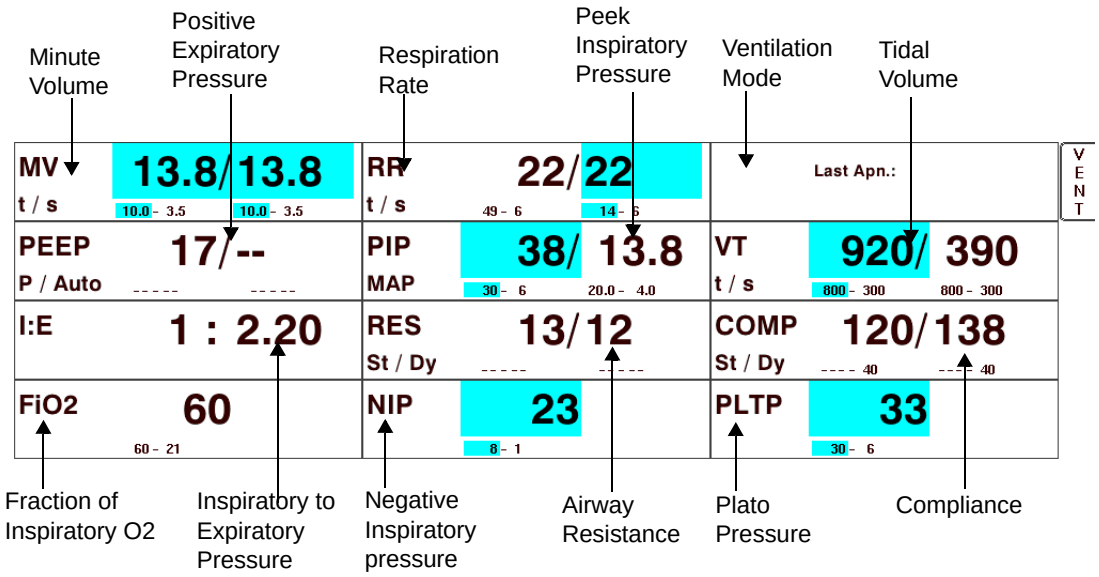


Figure 26-5: Main Screen with Ventilator Display

See the figure below for an explanation of the abbreviations.



Activating and Deactivating Ventilator Monitoring

Ventilator monitoring can be activated and deactivated in this panel. Monitoring can also be discontinued for whatever reason and resumed later.

➤ ***To activate and deactivate Ventilator monitoring:***

1. From the **Ventilator** menu select **Activate**. The **Ventilator Activate** panel is displayed.
2. Select the **Activate** checkbox to initiate Ventilator monitoring.
3. Press **Main Screen** to return to the main screen display.

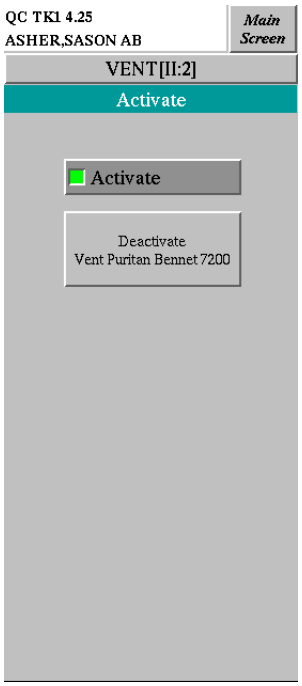


Figure 26-6: Parameter Activation Panel

Alarm Messages

The following technical ventilator alarm messages may appear on the Menntor X7 Screen.

Technical Alarm Messages
Safety Valve Open
Disconnect
O2 Inlet
Air Inlet
Low Battery
Valve Leak
Inoperable
Gas Supply Error
Communication Error

CHAPTER 27:
BIS - BISPECTRAL INDEX

The Menntor X7 monitor BIS input is an interface between Covidien's BISx unit and the Menntor X7 monitor’s display and data handling.

Introduction

The Menntor X7 BIS monitoring is a user-configurable system designed to monitor the hypnotic state of the brain based on acquisition and processing of EEG signals. The BISx processes raw EEG signals to produce a single number, called the Bispectral Index, or BIS, which correlates with the patient's level of hypnosis.

The Menntor X7 BIS display consists of:

- The current BIS number
- Trend graphs of processed EEG parameters in the CRG (see Chapter 8)
- Raw EEG waveforms in real time
- Various signal quality indicators (EMG, SQI)
- Suppression Ratio (if requested by the user)
- Burst Count number
- Alarm indicator and messages.

The BISx performs self-tests to ensure that the BISx is functioning properly and that impedance levels of patient sensors are within acceptable limits. Easy-to-use menus allow the user to change the data display and review stored data.

Indications for Use

Bispectral Index (BIS) monitoring is intended for use under the direct supervision of a licensed healthcare practitioner or by personnel trained in its proper use. It is intended for use on adult and pediatric patients within a hospital or medical facility providing patient care to monitor the state of the brain by data acquisition of EEG signals.

The BIS may be used as an aid in monitoring the effects of certain anesthetic agents. The use of BIS monitoring to help guide anesthetic administration may be associated with the reduction of the incidence of awareness with recall in adults during general anesthesia and sedation.

- The Bispectral Index is a complex technology, intended for use only as an adjunct to clinical judgment and training.
- In addition, the clinical utility, risk/benefit, and application of this device have not undergone full evaluation in the pediatric population.

WARNING!!! *This Menntor X7 patient monitor uses a component modular device in deriving the Bispectral Index (BIS) purchased from Covidien. it is important to recognize this index is derived using solely that company's proprietary technology. It is recommended that clinicians review applicable information on its utility and/or risks in published articles and literature/web site information from Covidien or contact said company if they have clinical-based BIS questions relating to this portion of the Menntor X7 Patient Monitor. Failure to do so could potentially result in the incorrect administration of anesthetic agents and/or other potential complications of anesthesia or sedation. We recommend that clinicians also review the following practice advisory (that includes a section on BIS monitoring): the American Society of Anesthesiologists, Practice Advisory for Intraoperative Awareness and Brain Function Monitoring (Anesthesiology 2006; 104:847-64). Clinicians are also recommended to maintain current knowledge of FDA or other federal-based regulatory, practice or research information on BIS and related topics.*

Cautions: BISx

Read this entire chapter carefully before using the monitor in a clinical setting.

Do not autoclave the BISx. Autoclaving will seriously damage the BISx components.

Do not open BISx for any reason. The seal to prevent liquids from entering the BISx may be damaged if opened. Service or repairs must be performed only by qualified biomedical technicians.

The BISx and the Menntor X7 BIS input were designed to operate with a BIS sensor. The sensor is a silver/silver chloride electrode array that utilizes Covidien's patented Zipprep technology and uses a proprietary connector. Use of other electrodes is not recommended.

Continuous impedance checking may need to be disabled if the 1 nanoampere 128 Hz impedance check signal interferes with other equipment (e.g., evoked potential monitors).

Take care when connecting the BISx to the BIS input to prevent damage to the connectors.

Before connecting the BISx to BIS input check the BISx and it's cables for any signs of deterioration.

CAUTION! *Clinical judgment should always be used when interpreting the BIS in conjunction with other available clinical signs. Reliance on the BIS alone for intra-operative anesthetic management is not recommended. As with any monitored parameter, artifacts and poor signal quality may lead to inaccurate BIS values.*

CAUTION! *Potential artifacts may be caused by poor skin contact (high impedance), muscle activity or rigidity, head and body motion, sustained eye movements, improper sensor placement and unusual or excessive electrical interference.*

CAUTION! *Due to limited clinical experience in the following applications, BIS values should be interpreted cautiously in patients with known neurological disorders and patients taking other psychoactive medications.*

WARNING!!! *Explosion Hazard: Do not use the BISx system in a flammable atmosphere or where concentration of flammable anesthetics may occur.*

- *Ensure that the BISx does not come into prolonged contact with the patient's skin, as it may generate heat and cause discomfort.*
- *The conductive parts of electrodes or sensor and connectors,*

including the natural electrode, should not come in contact with other conductive parts, including earth.

• *To reduce the hazard of burns in the high-frequency surgical neutral electrode connection, the sensor or electrodes should not be located between the surgical site and the Electro-Surgical unit return electrode.*

• *The sensor must not be located between defibrillator pads when a defibrillator is used on a patient connected to the Menntor X7 via the BIS sensor.*

• *To minimize the risk of patient strangulation, the Patient Interface Cable (PIC) must be carefully placed and secured*

Note: *Bispectral Index™, BISx™ , BISx logo, BIS™, the BIS logo, and Zipprep™ are trademarks of Covidien, Inc. and are registered in the U.S.A., E.U. and other countries.*

Installation and Preparation for Use

This section provides installation instructions for the Menntor X7 Monitor BIS, BISx, and accessories. It includes:

- Installation checklist
- Environmental considerations
- Required equipment and supplies
- Cable connections
- Start and shutdown procedures
- Initial menu settings

Installation Checklist

- ☐ Open packages and inspect all components:
  - Menntor X7 BIS interface cable (p/n 681-304-027)BISx (P/N 186-0195-SF)
  - BISx (P/N 186-0195-SF)
  - PIC (Patient Interface Cable, connects BISx to patient)
  - BIS Sensor
  - Basic set of 5 sensors are supplied with BISx and BIS. Additional Sensors are sold separately. For a list of available sensors please contact Covidien or your local distributor.
- ☐ Activate the BIS
- ☐ Connect BISx to PIC and sensor.

- ☐ Attach sensor to the patient's forehead.
- ☐ Perform sensor check.

Environment Considerations

Shipping and storage environment BISx

- Temperature -10°C to +60°C
- Humidity 15% to 95% (non-condensing)
- Pressure 360 mmHg to 800 mmHg

Operating environment BISx

The BISx is not designed for use in areas containing flammable gases or vapors.

- Temperature: 10°C to 40°C.
- Humidity: Relative humidity of 15% to 95%. – Non-condensing
- Pressure: 360 mmHg to 800 mmHg.

Site preparation

- Mount BISx firmly on the bedside or operating table.

Equipment and Supplies

- BISx
- Monitor Interface cable
- Menntor X7 Interface cable
- Patient Interface cable
- BIS Sensors

Figure 27-1: The BISx

BISx Features

The BISx receives, filters, and processes patient's EEG signals. It is located close to the patient's head where the EEG signal is less subject to interference from other medical equipment.

The BISx is shown Figure 27-1:. Its long flexible Monitor Interface Cable connects to the front of the Menntor X7 BIS input. The Patient Interface Cable (PIC) connects the BIS sensor to the BISx.

The attachment clip on the BISx is used to secure it in a convenient location near the patient's head.

WARNING!!! *Ensure that the BISx does not come into prolonged contact with patient's skin as it may generate heat and cause discomfort*

CAUTION! *Do not open BISx for any reason. The seal to prevent liquids from entering the BISx may be damaged if opened. Service or repairs must be performed only by qualified biomedical technicians.*

Patient Interface Cable (PIC)

BIS Sensor Patient Interface Cable (PIC) (see Figure 27-2:) connects the BISx to the BIS sensor.

Figure 27-2: BISx connected to the sensor on patient's forehead

BIS Sensors

After the BIS sensor has been placed correctly on the patient's head, it is connected to the PIC.

Cable Connections

After you have familiarized yourself with the safety information in the introductory section of this chapter and have prepared a suitable environment, prepare the Menntor X7 BIS for operation.

➤ ***To prepare the Menntor X7 BIS for operation:***

1. Connect the BISx to the BIS input.
2. Holding the cylindrical connector with the flat side up, plug the BISx Interface Cable into the Menntor X7 interface cable and the interface cable to the UIM port on the back or side of the monitor.

Once connected, the BISx need not be disconnected again. However, if you wish to disconnect the BISx cable from the monitor, carefully grasp the connector and pull.

DO NOT pull on the cable.

3. Connect the PIC to the BISx
4. Attach the gray connector of the Patient Interface Cable to the BISx.

Note: *Connect with the BIS logo facing up for proper pin alignment. To disconnect the PIC, grasp the connector housing and pull firmly.* ***DO NOT*** *pull apart by the cable wire.*

BIS Parameters

Table 27-1: BIS Parameters

Parameter	*Range*	*Description*
BIS	0 - 99	**Bispectral Inde**x: The measure of consciousness of a patient, (0 = no brain activity), (100 = fully conscious).
EMG	30 - 55 dB	**Electromyography**: The absolute power of muscle activity and artifacts in the 70 - 110 Hz range. Value is in dB with respect to 0.0001 μV^2.
SQI	0 - 100 %	**Signal Quality Index:** The percentage of good epochs and suppressed epochs in the last 120 epochs collected that could be used in the Bispectral Index calculation.
SR	0 - 100 %	**Suppression Ratio**: The percentage of epochs in the past 63 seconds in which the EEG signal is considered suppressed.
BC	0 - 30 Burst Count	The number of EEG bursts in the last minute. An EEG burst is a momentary period of EEG activity among isoelectric or flat EEG. Blanked if SR is less than 5.
SEF	0.5 - 30 Hz	**Spectral Edge Frequency**: The frequency at which 95% of the total.

Operating the Menntor X7 BIS

Note: *Read this section before operating the monitor in a clinical setting.*

Introduction

This section covers the following:

- Preparing for operation
- The sensor check
- The monitor screen display
- Software menus and menu selections
- Reviewing stored data
- The EEG display
- Ending a case

Preparing for Operation

After familiarizing yourself with the safety information in the introductory section of this manual, prepared a suitable environment, properly connected the BISx and PIC cables prepare the BIS for operation.

➤ ***To prepare the BIS for operation***

1. Select a BIS monitoring Profile

To start the BIS for the first time use the recommended Monitoring Profiles Page page 27-21 .

See Appendix D: Setting Up the System to create the required monitoring profiles.

2. Attach BIS Sensor to Patient
3. Prepare sensor site and place the BIS sensor on the patient in accordance with the instructions included on the sensor package.

CAUTION! *The Menntor X7 BIS was designed to operate with a BIS sensor. The sensor is a silver/silver chloride electrode array that utilizes Covidien's patented Zipprep technology and uses a proprietary connector. Use of other electrodes is not allowed*

4. Secure the BISx
5. Using the attachment clip, secure the BISx to a convenient location near the patient's head.

6. Attach the BIS Sensor to the PIC: To insert the sensor into the PIC, line up as shown and insert the sensor tab into the PIC sensor connector until an audible “click” is heard. The blank side of the sensor tab (i.e. the side without the computer chip) should be facing up.

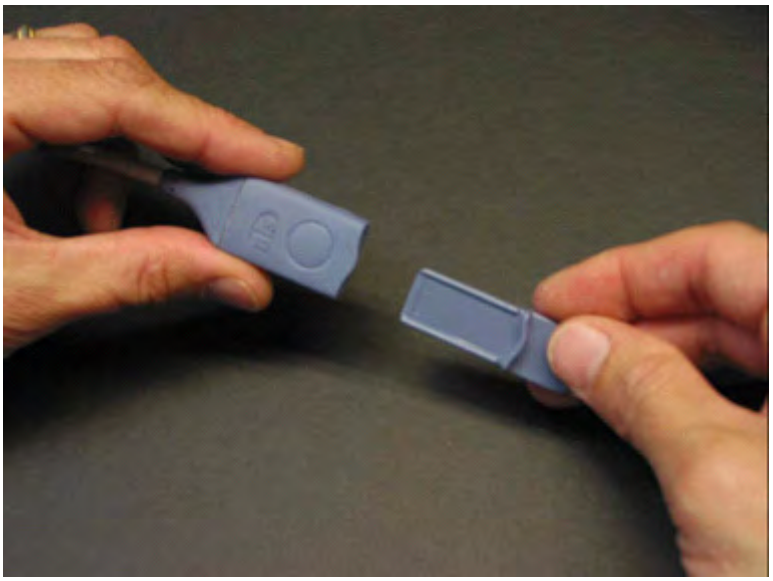


Figure 27-3: Connecting the PIC

The Sensor Integrity Check is initiated each time a sensor is connected to the PIC. It checks to make certain that a valid, unexpired sensor is in use.

The LED on the front panel of the BIS will display the status of BISx and Sensor connection.

Table 27-2: BISx and Sensor connection status

State	***Color***	***Alarm***
Bisx disconnected	Red	Par. 18
BISx fault	Red	
Sensor not connected	Blinking red	
Sensor fault	Blinking red	
Replace sensor	Blinking red	
Incompatible sensor	Blinking red	
Artifact	Blinking Green	
BISx and Sensor OK	Green	

Monitoring Procedures

BIS monitoring is set up through the BIS menu dialog panels. Each dialog panel enables controling different aspects of BIS monitoring. The available panels are:

• Lead/Gain

Use this panel to select the required lead and gain for monitoring EEG.

For details see “Setting BIS Leads and Gain” on page 27-11.

• Alarm Limits

Use this panel to set BIS alarm limits and criteria.

For details see “Setting BIS Alarm Limits” on page 27-12.

• Alarm Response

Use this panel to define the way the Menntor X7 responds to BIS alarm events. See “Setting the BIS Alarm Response” on page 27-13.

• Display Options

Use this panel to configure the way BIS and Quality parameters are displayed on the main screen.

For details see “Setting BIS Display Options” on page 27-15.

• Filter

Use this panel to set filter selected for the EEG signal .

For details see “Setting EEG Filter” on page 27-17.

• Sensor Check

Use this panel to activate and view the results of the BIS Sensor check

• Activate

Use this panel to activate or deactivate BIS monitoring.

For details see “Activating and Deactivating BIS Monitoring” on page 27-20.

All the above mentioned panels can be accessed from the BIS menu.

Accessing the BIS Menu

There are two ways to access the BIS menu:

• From the Vital Signs menu

• From the main screen display

➤ ***To access the BIS menu:***

1. From the main menu select **Vital Signs**.

The Vital Signs menu appears.

2. From the **Vital Signs** menu, select **BIS**.

The BIS menu is displayed.

➤ ***To access the BIS menu from the main screen display:***

1. Turn the QuicKnob™ until the BIS parameter key is highlighted and press to display the BIS menu.

Setting BIS Leads and Gain

Select the required lead and gain for monitoring respiration in the Lead/Gain dialog panel:

- **EEG Lead display selection**: One (1) or two (2) EEG leads can be displayed.
- **EEG Gain Control**: Select either 5, 10, 25, 50, or 100 µV/cm

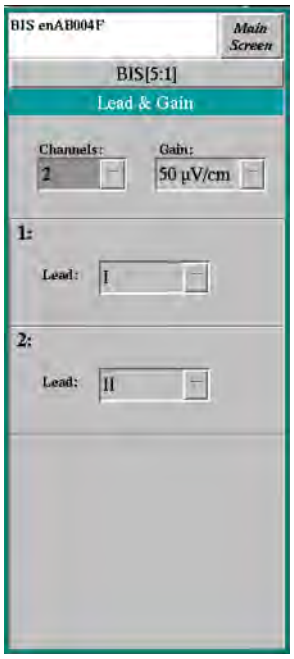


Figure 27-4: The BIS - EEG Lead/Gain Dialog Panel

➤ ***To set EEG leads and gain:***

1. From the BIS menu

–or–

if you are already in another BIS dialog panel, from the drop-down menu list below the

BIS title area, select **Lead/Gain**.

2. Select either 1 or 2 , EEG leads, as required. Only one option can be selected.
3. Set the required gain. The available options are: 5, 10, 25, 50, or 100 µV/cm
4. Set the **Smoothing Rate** : 10, 15, 30 second, Default is 15 seconds. For ICU it is recommended to use 30 seconds.
5. Press **BIS** to return to the BIS menu,

–or–

Press **Main Screen** to return to the main screen display.

Setting BIS Alarms

BIS alarm parameters are set in two dialog panels, Alarm Limits and Alarm Response. Each dialog panel controls a different aspect of BIS alarms.

Setting BIS Alarm Limits

The Alarm Limits dialog panel enables you to set BIS alarm limits. and • **BIS** – BIS is calculated by the BISx and displayed on the monitor. The monitor checks that the BIS value is within a specific range (between 0-100). Any BIS value rate outside of the allowed limits triggers an alarm.

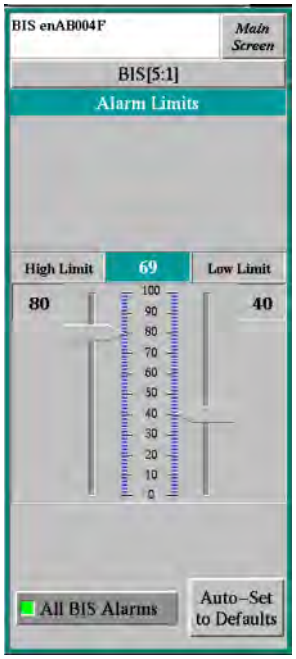


Figure 27-5: The BIS Alarm Limits Dialog Panel

➤ ***To set alarm limits parameters:***

1. From the **BIS** menu choose **Alarm Limits**

–or–

if you are already in another BIS dialog panel, from the drop-down menu list below the BIS title area, select **Alarm Limits**.

2. Turn the QuicKnob™ until the low alarm limit scale is highlighted and press.
3. Turn the QuicKnob™ to the required alarm limit and press. Repeat the procedure for the high alarm limit. The range for each limit is 0-100. The limits are change in steps of one unit.

–or–

Select **Auto Set to Defaults** to set high and low alarm limits to default values.

4. Select the **All BIS Alarms** checkbox to activate or deactivate BIS alarm detection. When deactivated, the sliders for setting alarm limits are disabled.
5. Press **BIS** to return to the RBIS menu

–or–

Press **Main Screen** to return to the main screen display.

Setting the BIS Alarm Response

Define the way the Menntor X7 visually and audibly responds to BIS alarms in the BIS Alarm Response dialog panel. Default response values are set in System Configuration.

By configuring the parameters on this panel you can :

- Define whether visual alarm messages, audible alarm tones or both signal a triggered alarm.
- Activate recording of the patient's EEG waveform when an alarm is detected.
- Create an EEG event strip waveform when an alarm is detected.

Figure 27-6: The BIS Alarm Response panel

➤ ***To set BIS Alarm responses:***

1. From the BIS menu

–or–

if you are already in another BIS dialog panel, from the drop-down list below the title area, select **Alarm Response**.

The Alarm Response dialog panel is displayed.

2. Under **BIS Alarm**:

- Select the **Tones** checkbox to activate or deactivate audible alarms ; By default, this checkbox is selected.
- Select the **Record** checkbox to activate or deactivate recording of the patient's EEG during the alarm event.
- Select the **Event Strip** checkbox to create an Event Strip of the patient's waveforms during the alarm event.

3. Press **BIS** to return to the BIS menu,

–or–

Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting BIS Display Options

You can change the way BIS parameters and EEG waveforms appear on the main screen display to suit your hospital's or department's particular needs by defining Display Options parameters. Any changes made are immediately reflected on-screen.

By setting the parameters on the **Display Options** dialog panel you can :

- Instruct the monitor to display BIS either in "Waveform area", "Big Number" format on screen or as a "Secondary" Vital Sign.
- Set the Sweep Speed.
- Define the color of BIS value and EEG waveforms as they are displayed on screen. All waveforms and values have the same color, unless they go into alarm, in which case the value takes on the alarm background color. When the alarm condition passes, the original color is restored.
- Configure the following Quality values to be displayed or not:
- SQI, EMG, SR, BC as required
- Display of BIS High/Low Rate Limits.

Note: *When BIS appears in BIG Number area, all of the above items can fit into the Big Number display area.*

Note: *When BIS appears in Secondary area, only the BIS value is displayed.*

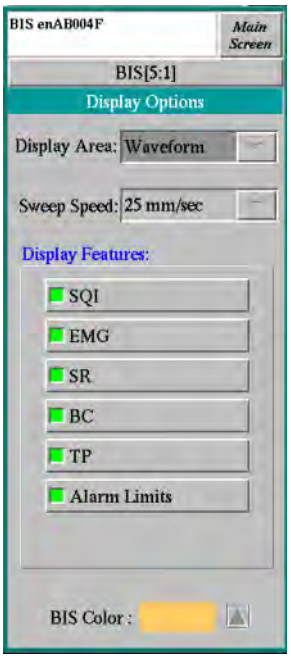


Figure 27-7: The BIS Display Options Dialog Panel

➤ ***To set display options:***

1. From the BIS menu

–or–

if you are already in another BIS dialog panel, from the drop-down list below the title area, select **Display Options**.

The Display Options dialog panel is displayed.

2. From the **Display Area** drop-down list, select the area where you want BIS to be displayed on screen.
   Available options are: Waveform, Secondary VS area, and Big Numbers. The default is Waveform.
3. From the **Sweep Speed** drop-down list, select the required sweep speed.
   Available options are ECG Sweep Speed, 6.25 mm/sec. 12.5 mm/sec and 25 mm/sec. The default is 25 mm/sec.
4. Under Display Features:
   - Select the SQI, EMG, SR, BC checkboxes to activate or deactivate display of the relevant parameters.
   - Select the Alarm limits checkbox to activate or deactivate display of this values on screen.
5. Select **BIS Colors**, and select the color required for BIS parameters; Default color is orange.
6. Press **BIS** to return to the BIS menu,

–or–

Press **Main Screen** to return to the main screen display.

Note: *Checkboxes appear green when activated and gray when deactivated.*

Setting EEG Filter

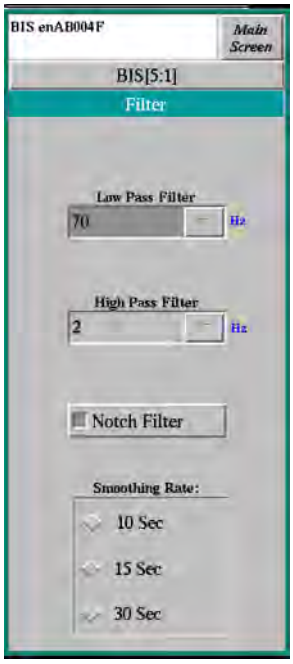


Figure 27-8: BIS Filter setting panel

➤ ***To set BIS EEG Filter:***

1. From the **BIS** menu

–or–

if you are already in another BIS dialog panel, from the drop-down list below the title area, select **Filter**. The **Filter** dialog panel is displayed.

2. Under **Filter**:

- Set the Low pass limit ; By default, the Low Pass limit is 70.
- Set the High pass limit ; By default, the High Pass limit is 1.
- Set the Noth filter ; By default, the Notch filter is On.
- Set Smoothing Rate: 10, 15, 20 seconds

3. Press **BIS t**o return to the BIS menu,

–or–

Press **Main Screen** to return to the main screen display.

Sensor Check

The Sensor Check tests the impedance of each electrode on the BIS sensor to verify that it is within an acceptable range for monitoring. A Sensor Check is initiated automatically by the user by pressing the Sensor Check key.

The screen shows a sensor with each electrode numbered. Colors indicate the status of each electrode:

- White hollow circle – No status is available (Lead is off).
- Green circle – The electrode impedance is within the acceptable range. Monitoring can begin.
- Red blinking circle – The electrode impedance is not within the acceptable range.

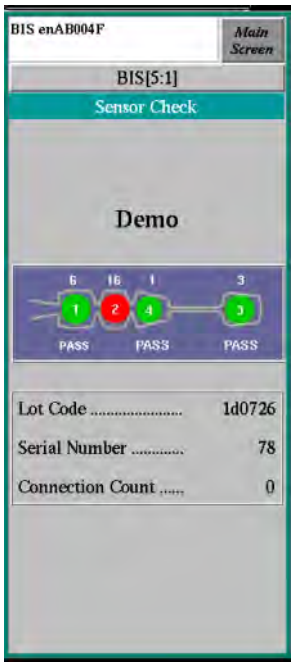


Figure 27-9: The Sensor Check Graphic Screen

Sensor Type

At the top of the panel you will find the sensor type.

Electrode Check

Below in this display, the impedance value for each electrode, in kilo ohms, appears on the screen along with its status:

PASS - An electrode passes if the impedance for that electrode is less than 7.5 kilo ohms.

Note: *The ground electrode (element #2) must be less than 30 kilo ohms to pass.*

HIGH - An electrode is labeled "HIGH" if its impedance value is above 7.5 kilo ohms. As long as the combined impedance of electrodes #1 and #3 and the combined impedance of electrodes #1 and #4 are less than 15 kilo ohms, the sensor check will be considered successful. If the combined impedance is over the 15 kilo ohms limit, you will need to re-prep the electrodes and check all connections. The monitor will continue to check impedance until it is acceptable.

NOISE - If the signal from the electrode goes beyond the measurable range, the label "NOISE" displays. Re-prep the electrodes and check all connections.

LEAD OFF - If the impedance check indicates that the electrode is not in contact with the patient, the label "LEAD OFF" displays. Re-prep the electrodes and check all connections.

The monitor continues updating the values until all impedance values are acceptable. To end the impedance test, press [**EXIT**].

The Sensor Check impedance test must be successfully completed before normal processing resumes.

Sensor Parameters

On the lower part of the Sensor Check panel there is a display of:

- Lot code
- Serial Number
- Connection Count

➤ ***To start BIS sensor check:***

1. From the **BIS** menu

–or–

if you are already in another BIS dialog panel, from the drop-down list below the title area, select Sensor check. The sensor check will start.

2. At the end of the check procedure the measured impedance will be displayed on the panel with Green color for Pass and Red color for fail. See Figure 27-9:
3. Press **BIS** to return to the BIS menu,

–or–

Press **Main Screen** to return to the main screen display.

ICU Mode – Recommended Setting

When the ICU Mode is used use the following settings:

1. Set BIS Smoothing Rate to 30 Second.
2. BIS Trend interval is set to 60 minutes on both Waveform + Trend and/or CRG.

Activating and Deactivating BIS Monitoring

BIS monitoring can be activated or deactivated in the Activate panel.

You can also temporarily discontinue monitoring for whatever reason and resume monitoring at a later time.

➤ ***To activate/deactivate BIS monitoring:***

1. From the BIS menu

–or–

if you are already in another BIS dialog panel, from the drop-down list below the title area, select Activate. The Activate dialog panel is displayed.

2. Select the Activate checkbox to activate or deactivate BIS monitoring.
3. Press **BIS** to return to the BIS menu,

–or–

Press **Main Screen** to return to the main screen display.

BIS Monitoring Profile

Following are some examples of recommended Monitoring Profiles used to display BIS parameter.

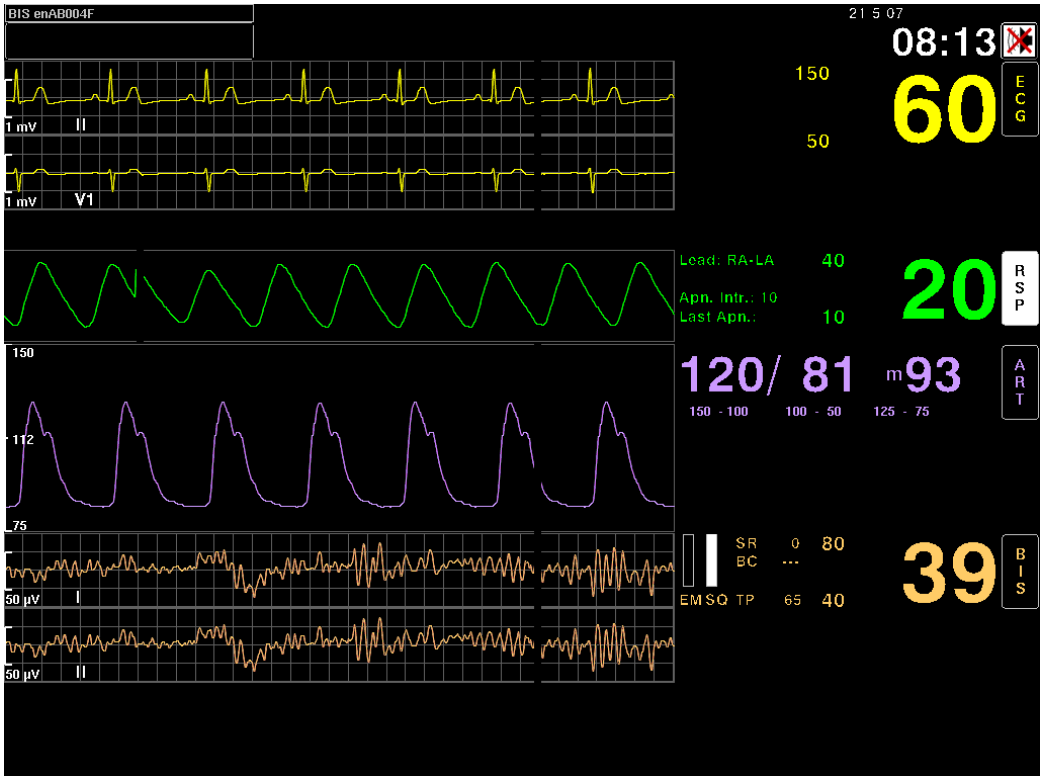


Figure 27-10: BIS Waveform display

Real time BIS and its quality bars, and parameters are displayed with one or two EEG channels. BIS is displayed together will other vital signs.

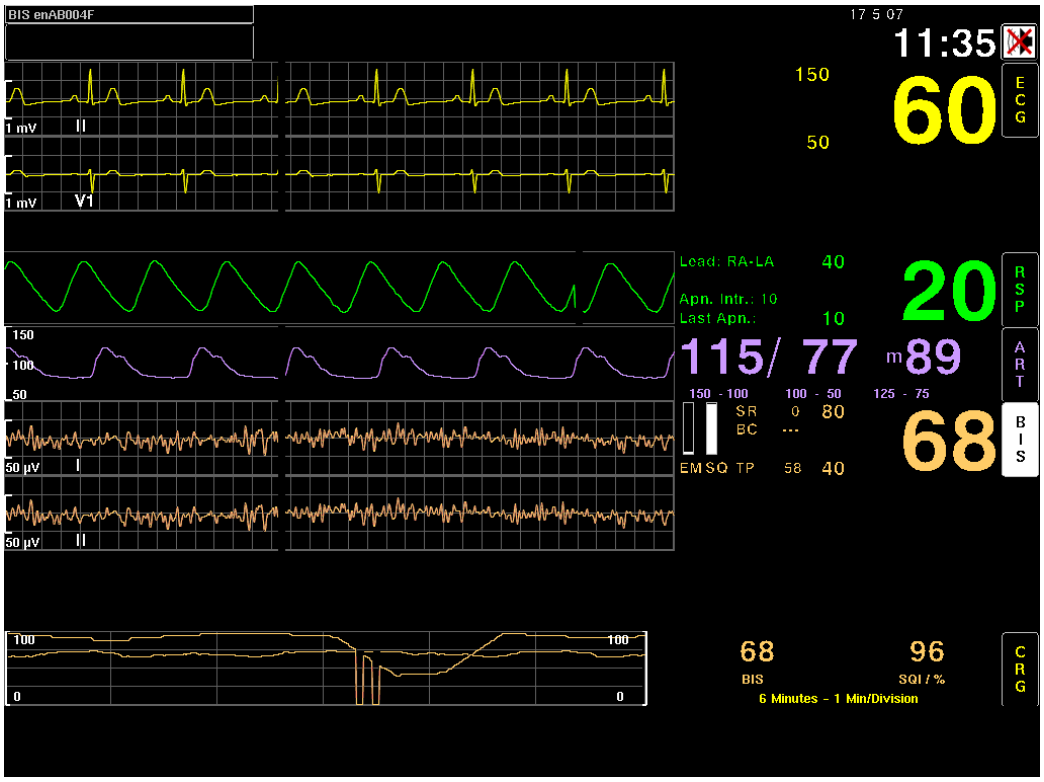


Figure 27-11: BIS Waveform and full trend using CRG mode

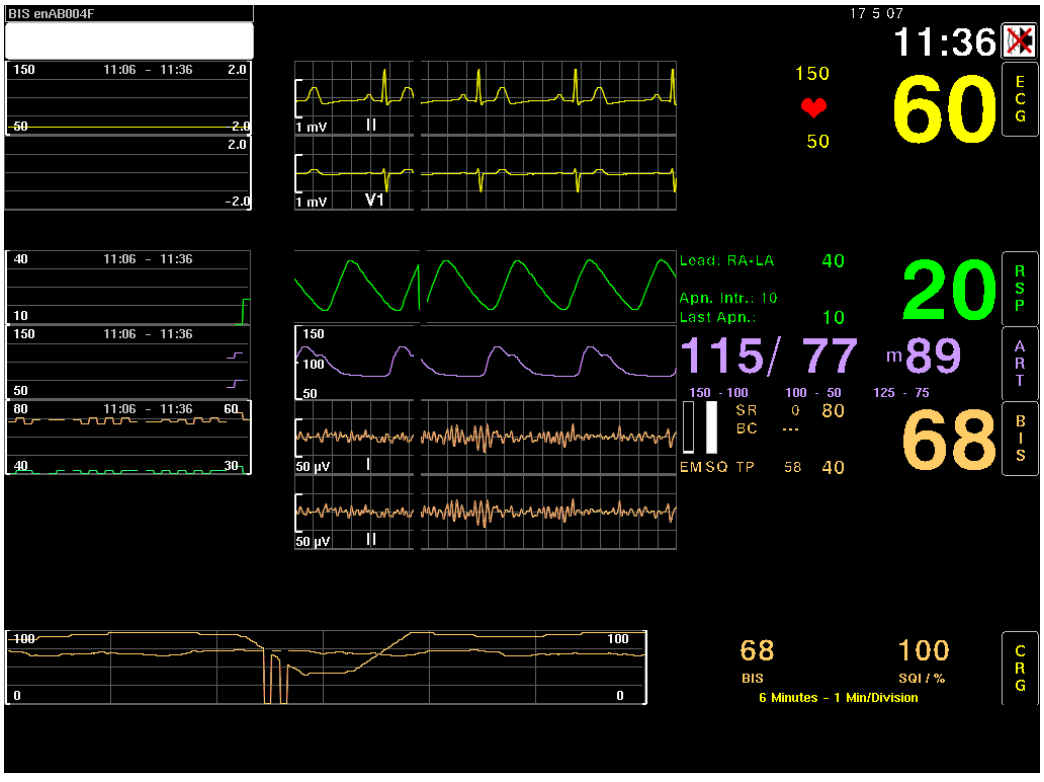


Figure 27-12: BIS Waveform + Trend display

This profile shows about 5 seconds of real time EEG together with a Trend of BIS and EMG

➤ ***To create BIS waveforms display:***

1. From the **BIS** menu select **Display Option**.
2. From the **Display Area** drop-down list, select **Waveform.**
3. Press **BIS** to return to the BIS menu,

   –or–

   Press **Main Screen** to return to the main screen display.

➤ ***To create BIS waveforms+ Trend display:***

1. From the **BIS** menu select **Display Option**.
2. From the **Display Area** drop-down list, select **Waveform**.
3. From the **Setup** menu select **Display Control.**
4. Select **Display Format = Waveform + Trend**.
5. Set the **Trend Time** scale: 15,30,60,120 minute
6. Press **Main Screen** to return to the main screen display.

➤ ***To create BIS waveforms + CRG Trend:***

1. From the **BIS** menu select **Display Option**.
2. From the **Display Area** drop-down list, select **Waveform**.
3. From the **Setup** menu select **CRG.**
4. Select **CRG 1**
5. Set the **Duration**: 15,30,60,120 minute.
6. Select the first Vital Sign = BIS.
7. Select the second Vital Sign = EMG.
8. Set **CRG** = On.
9. Press **Main Screen** to return to the main screen display.

BIS Data Storage

BIS data and Quality parameters are stored and can be display in Trend and Chart.

Refer to chapter 10 Reviewing Patient Data for details.

BIS Cleaning and Preventive Maintenance

Introduction

This section describes:

- Care and cleaning procedures
- Routine maintenance
- Technical documentation
- Instrument Identification.

Care and Cleaning

Cleaning the BISx

Clean any spillage of blood or solutions on either the monitor or BISx as soon as possible.

Dried blood is very difficult to remove. Use lint-free absorbent towels for spill cleanups.

Dampen the towel with detergent and lukewarm water to aid in cleaning. After cleaning, wipe the PIC connector ends with alcohol and allow to dry completely. Residual moisture inside the connector may affect BISx performance.

Disinfecting the BISx

Use lint-free absorbent towels dampened with a 10% bleach solution, or a commercial disinfectant (e.g. Lysol® Professional Disinfectant Foam Cleaner Spray or PDI Germicidal Disposable Wipes).

After cleaning, dry all areas except the monitor display screen (see below) with a lint-free absorbent paper towel. Wipe the BISx and PIC connector ends with alcohol and allow to dry completely.

WARNING!!! *WHENEVER AN EVENT SUCH AS SPILLAGE OF BLOOD OR SOLUTIONS OCCURS, RE-TEST GROUND LEAKAGE CURRENT BEFORE FURTHER USE.*
DO NOT MIX DISINFECTING SOLUTIONS (e.g., BLEACH AND AMMONIA) AS HAZARDOUS GASES MAY RESULT.

CAUTION! *Do not autoclave the BISx or Monitor. Autoclaving will seriously damage both components.*

CAUTION! *Avoid liquid ingress to the Patient Interface Cable. Contact of fluids with the PIC sensor connectors can interfere with PIC performance.*

Maintenance

No periodic adjustment or calibration is required for the BISx and BIS. Suggested routine maintenance includes: periodic checking of cable integrity, system checkout.

CAUTION! *Service or repairs must be performed only by qualified biomedical technicians.*

Checking Cable Integrity

The BIS should be inspected periodically to ensure that all cables are in working order, with no cuts in electrical insulation. Cables can be flexed during the system checkout to ensure there are no loose wires.

Service

Field repair or customer repairs are limited by design to replacement of major component assemblies such as: the Patient Interface Cable (PIC), BISx, the BIS.

Instrument Identification

BIS Part Numbers

The BISx identification information is permanently marked on the rear panel of the BISx.

Software Revision Numbers

Software revision numbers are displayed in the Software version panel of the Menntor X7 monitor.

Sensors

The BIS with the BISx can be used with the following sensors:

- **Quarto, Pediatric (4-lead)**, Extend, SRS.
- **Quarto Sensor** Aspect Part number 186-0106
- **Pediatric Sensor** Aspect Part number 186-0200

  Recommended for routine pediatric use
- **SRS sensor** Aspect Part number 186-0164

  This kit consists of a semi reusable cable and disposable electrode set

Note: *The BIS sensor are supplied by Aspect or its distributors and not by Mennen Medical*
To locate the Covidien distributor in your area contact Mennen Medical or directly Aspect http://www.aspectmedical.com/contact.

BIS Trouble Shooting

Table 27-3: Error Messages and what to do

Message	***Problem***	***What to do***
Isoelectric EEG Detected	No discernible EEG activity is detected for sixty-three seconds; SR=100.	Note: This message notifies user of a flat line EEG. This is a normal condition when Sensor Simulator or Test Sensor is connected. **If unintended:** 1. Check patient vital signs, dosage, etc. 2. Check leads for proper connection and possible shorts. 3. Verify Sensor Check passes. 4. Verify DSC Self-test passes. 5. Verify PIC. Use Test Sensor or Sensor Simulator and Sensor Check.
Sensor Negative Ground or Sensor Positive Ground	Problem is detected relating to sensor ground element.	1. Disconnect and examine sensor connection. Clean any contamination present. 2. Replace sensor if necessary. 3. Replace PIC. 4. Replace BISx.
Sensor Over current	Sensor is using too much current.	1. Disconnect and examine sensor connection. Clean any contamination. 2. Replace sensor if necessary. 3. Replace PIC. 4. Replace BISx.
No more Uses for this Sensor	Sensor has been connected and disconnected too many times	Replace the sensor.
Sensor Invalid	Poor or contaminated connection between sensor and PIC	Connect / clean connection between sensor and PIC.
	An incorrect or defective sensor has been connected to the PIC	Replace the sensor
	Defective PIC	Replace the PIC
	Defective BISx	Replace the BISx

CHAPTER 28: CO/CCO/SvO2

Overview

The Menntor X7 monitor has interface capability to other vendor devices, that measure Continuous Cardiac Output (CCO) and venous Oxygen saturation (SvO2), via it's Universal Input (UIM).

Three devices are supported:

- Vigilance by Eduards Lifesience
- Vigileo By Eduards Lifesience
- PiCCO by Pulsion

The technology used by each of these devices is different, but they measure the same basic vital signs, with additional derived parameters that differ from one technology to the other

Eduards Vigilance

Eduards Vigilance is a device that measures:

- Cardiac Output (CO) by thermal dilution with Swan-Ganz catheter.
- Continuous Cardiac Output (CCO) with special heating catheter introduced into a central vein, with sensing thermistor in the Pulmonary Artery.
- SvO2 by fiber optic catheter.

Additional stored parameters are

- Continuous End Diastolic Volume (CEDV)
- Systemic Vascular Resistance (SVR)
- Stroke Volume (SV)
- RV Ejection Fraction (RVEF)

Eduards Vigileo

Eduards Vigileo is a device that measures:

- Cardiac Output (CO) by thermal dilution with Swan-Ganz catheter.
- Arterial Blood Pressure.
- From the pulse pressure it derives CCO, using the basic physiological principle that pulse pressure is proportional to stroke volume.

Additional stored parameters are:

- Cardiac Output Index (CCI)
- Stroke Volume and Stroke Volume Index (SV/SVI) and
- Stroke Volume Variations and Index (SVR/SVRI)

Pulsion PiCCO

PiCCO is a device that measures:

- Cardiac Output (CO) using Left Ventricular Thermal Dilution method.
- Arterial Blood Pressure.
- From the pulse pressure it derives CCO, using the basic physiological principle that pulse pressure is proportional to stroke volume.
- SvO2 by fiber optic catheter.

Additional stored parameters are:

- Cardiac Index (CI)
- Stroke Volume (SV)
- Stroke Volume Index (SVI)
- Pulse Pressure Variation (PPV)
- Stroke Volume Variation (SVV)
- Systemic Vascular Resistance (SVR)
- Systemic Vascular Resistance Index (SVRI)
- Global End-Diastolic Volume (GEDV)
- Global End-Diastolic Volume Index (GEDI)
- Global Ejection Fraction (GEF)
- Extra-vascular Lung Water (EVLW)
- Intrathoracic Blood Volume (ITBV)

- Intrathoracic Blood Volume Index (ITBI)
- Pulmonary Vascular Permeability Index (PVPI)
- Index of Left Ventricular Contractility (dPmx)
- Cardiac Power Output (CPO)
- Cardiac Power Output Index (CPI)
- Cardiac Function Index (CFI)

PiCCO2 has also optional SpO2 measurement .This will add the following parameters:

- SpO2
- Oxygen Delivery (DO2)
- Oxygen Delivery Index (DO2I)

The Menntor X7 UIM input allows the user to display and store CO/CCO and SvO2 and set alarm limits which, when violated, trigger clinical alarms.

Note: *The display by the Monitor of an Auxiliary Device function should be regarded as secondary duplication of the functions. This secondary duplication should be used for user convenience in comparing data and registering events for data management purposes. The Menntor X7 Monitor should not be considered the primary monitoring display for the Auxiliary Device. The Auxiliary Device should always be considered the primary monitoring source. Should any discrepancy arise between the Auxiliary Device and the Menntor X7 Monitor, the Auxiliary Device always takes priority.*

UIM Input as Vigilance/Vigileo/PiCCO

The input can detect and provide the following:

- CO and CCO value
- ART (Vigileo amd PiCCO)
- SvO2 value
- Clinical Alarm Processing
- Technical Alarm Notification
- Storage of all additional parameters

CO/CCO Monitoring Procedures

The CO menu provides access to specific dialog panels enabling interaction with all aspects of CO/CCO monitoring. Each dialog panel enables control of different aspects of CO/CCO monitoring. The available dialog panels are:

- **Aquire**

Note: *(Dimmed, not in use)* .

- **Edit Curve**

Note: *(Dimmed, not in use)* .

- **Alarm Limits**

  Use this panel to activate/deactivate CO alarms, define CO alarm limits. See "Setting CO Alarm Limits" .

  Note that CO alarm is only relevant for Continuous Cardiac Output

- **Alarm Response**

  Use this panel to define the way alarms are heard and displayed on the monitor. See "Setting CO Alarm Response".

- **Patient Identification**
  (Dimmed, not in use) .

- **Display Options**

  Use this panel to define how CO values appear on the main screen display.

  See "Setting CO Display Options".

- **Activate**

  Use this panel to activate/deactivate CO monitoring, See "Activating and Deactivating CO Monitoring".

Accessing the CO/CCO Menu

The CO menu can be accessed from the Vital Signs menu or from the main screen display.

➤ ***To access the CO/CCO panel from the Vital Signs menu:***

1. Press the **Vital Signs** key on the front panel. The **Vital Signs** menu appears. CO/CCO and SvO2 currently monitored appear on the **Vital Signs** menu.
2. From the Vital Signs menu, select CO. The appropriate menu is displayed.

➤ ***To access the CO panel from the main screen display:***

- Turn the QuicKnob™ until the CO parameter key is highlighted and press to access the CO panel

Setting CO Alarms

CO alarm parameter is set in two dialog panels: Alarm Limits and Alarm Response. Each dialog panel controls a different aspect of CO.

Note: *The alarm limit settings should always be set and monitored in the Auxiliary device as the primary setting for the alarms.*

Setting CO/CCO Alarm Limits

The Alarm Limits dialog panel controls activation and deactivation of CO alarms, defines CO alarm limits.

By configuring parameters on this panel you can:

- **Activate or deactivate CCO alarms.**
- **Set low and high CO alarms.**

➤ ***To set CO alarm limits:***

1. From the CO menu select **Alarm Limits**
2. Select the All CO Alarms checkbox to activate or deactivate both high and low limit alarms. When deactivated, alarm detection is disabled and the slider is disabled
   –or–
   Select the Enable Alarm checkbox located below the Low or High Limit alarm scale to activate detection of that alarm limit.
3. Using the QuicKnob™, set the left marker on the slider bar to the required high alarm limit for the CO, then set the right marker to the required low alarm limit. These limits are displayed in the High and Low Limit value areas on the panel
   –or–
   Press **Auto Set to Defaults** to automatically set alarm limits to default values.
4. Press **Main Screen** to return to the main screen display.

Setting CO Alarm Response

The Alarm Response panel controls the way the Menntor X7 responds to CO alarm.

The panel is divided into two areas:

- **CO alarm**
- **CO Fault alarms**

➤ ***To set alarm response preferences:***

1. From the CO menu select Alarm Response. The Alarm Response panel appears.
2. Under **CO Alarms**:

   • Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.

   • Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
3. Under **CO Fault Alarms**:

   • Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.

   • Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated
4. Press **Main Screen** to return to the main screen display

Setting CO Display Options

The CO Display Options panel enables you to control the way CO values appear on the main screen display. You can set the display to suit your hospital's or departments particular needs. Any changes made are immediately reflected on screen.

By setting the parameters on the Display Options panel you can:

- Instruct the monitor to display CO information in the Waveform area, as a Secondary Vital Sign, or in "Big Number" area on screen.
- Define the color of CO values as they are displayed on the screen.

Note: *Values have the same color unless they go into alarm, in which case the value takes on the alarm priority color. When the alarm condition terminates, the original color is restored.*

- Configure the following values to be displayed or not, as required: Alarm Limits, and/or Units .

➤ ***To set CO Display Options:***

1. From the **CO** menu select **Display Options**. The **Display Options** panel opens.
2. From the **Display Area** drop-down list, select the area where you want the CO to be displayed on screen.

   The options are: **Waveform**, **Secondary VS** and **Big Numbers**. The default is **Waveform**.
3. Under **Display Features**:

   • Select the Alarm Limits, and Display Units checkboxes to activate or deactivate display of these parameters on the main display screen.
4. From the **CO Color** list, select the color required for CO parameters. You have a choice of 16 colors.

SvO2 Monitoring Procedures

The SvO2 menu provides access to specific dialog panels enabling interaction with all aspects of SvO2 monitoring. Each dialog panel enables SvO2 control of different aspects of SvO2 monitoring. The available dialog panels are:

- **Alarm Limits**

Use this panel to activate/deactivate SvO2 alarms, define SvO2 alarm limits, See "Setting SvO2 Alarm Limits".

- **Alarm Response**

Use this panel to define the way alarms are heard and displayed on the monitor. See "Setting SvO2 Alarm Response".

- **Display Options**

Use this panel to define how SvO2 values appear on the main screen display. See "Setting SvO2 Display Options" .

- **Activate**

Use this panel to activate/deactivate SvO2 monitoring, See "Activating and Deactivating SvO2 Monitoring" .

Accessing the SvO2 Menu

The SvO2 menu can be accessed from the Vital Signs menu or from the main screen display.

➤ ***To access the SvO2 panel from the Vital Signs menu:***

1. Press the Vital Signs key on the front panel. The Vital Signs menu appears. SvO2 currently monitored appear on the Vital Signs menu.
2. From the Vital Signs menu, select SvO2. The appropriate menu is displayed.

➤ ***To access the SvO2 panel from the main screen display:***

- Turn the QuicKnob™ until the SvO2 parameter key is highlighted and press to access the SvO2 panel.

Setting SvO2 Alarms

SvO2 alarm parameter is set in two dialog panels: **Alarm Limits** and **Alarm Response**. Each dialog panel SvO2 controls a different aspect of SvO2.

Note: *The alarm limit settings should always be set and monitored in the Auxiliary device as the primary setting for the alarms.*

Setting SvO2 Alarm Limits

The Alarm Limits dialog panel Controls activation and deactivation of SvO2 alarms, defines SvO2 alarm limits.

By SvO2 configuring parameters on this panel you can:

- **Activate or deactivate SvO2 alarms.**
- **Set low and high SvO2 alarms**

➤ ***To set SvO2 alarm limits:***

1. From the **SvO2** menu select **Alarm Limits**.
2. Select the **All SvO2 Alarms** checkbox to activate or deactivate both high and low limit alarms. When deactivated, alarm detection is disabled and the slider is disabled

   -or-

   Select the **Enable Alarm** checkbox located below the Low or High Limit alarm scale to activate detection of that alarm limit.
3. Using the QuicKnob™, set the left marker on the slider bar to the required high alarm limit for the SvO2, then set the right marker to the required low alarm

limit. These limits are displayed in the **High** and **Low Limit** value areas on the panel.

-or-

Press **Auto Set to Defaults** to automatically set alarm limits to default values.

5. Press **Main Screen** to return to the main screen display.

Setting SvO2 Alarm Response

The Alarm Response panel SvO2ntrols the way the Menntor X7 responds to SvO2 alarm.

The panel is divided into two areas:

- **SvO2 alarm**
- **SvO2 Fault alarms**

➤ ***To set alarm response preferences:***

1. 1. From the **SvO2** menu select **Alarm Response**. The **Alarm Response** panel appears.
2. Under **SvO2 Alarms**:

   • Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.

   • Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
3. Under **SvO2 Fault alarms**:

   • Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.

   • Select the **Tones** checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.

   • Select the **Event Strip** checkbox to activate or deactivate Event Strip. By default, the checkbox is deactivated.

4. Press **Main Screen** to return to the main screen display.

Setting SvO2 Display Options

The SvO2 Display Options panel enables you to control the way SvO2 values appear on the main screen display. You can set the display to suit your hospital's or departments particular needs. Any changes made are immediately reflected on screen.

By setting the parameters on the Display Options panel you can:

- **Instruct the monitor to display SvO2 information in the Waveform area, as a Secondary Vital Sign, or in "Big Number" area on screen.**
- **Define the color of SvO2 values as they are displayed on the screen.**

Note: *Values have the same color unless they go into alarm, in which case the value takes on the alarm priority color. When the alarm condition terminates, the original color is restored.*

- **Configure the following values to be displayed or not, as required: Alarm Limits, and/or Units .**

➤ ***To set SvO2 Display Options:***

1. From the **SvO2** menu select **Display Options**. The **Display Options** panel opens.
2. From the **Display Area** drop-down list, select the area where you want the SvO2 to be displayed on screen. The options are: **Waveform**, **Secondary VS**, and **Big Numbers**. The default is **Waveform**.
3. Under **Display Features**:

   • Select the **Alarm Limits**, and **Display Units** checkboxes to activate or deactivate display of these parameters on the main display screen.
4. From the **SvO2** color list, select the color required for SvO2 parameters. You have a choice of colors.

Trend

Up to 8 of the Vigilance / Vigileo and PiCCO vital signs and derived parameters can be shown as a graphic trend. For use of graphic Trends see “Trends” on page 10-2.

Chart

All Vigilance / Vigileo and PiCCO vital signs and derived parameters are stored in a chart.

➤ ***To create a PiCCO chart***

1. In **System Setup** select **Tabular Charts**.
2. In **Tabular Charts** enter UDC (User Defined Chart) to create the list of parameters to be included in the chart.

The UDC panel offer several lists of parameters. It is possible to create a chart from parameters appearing in different lists.

See also Appendix D “Tabular Charts” on page D-69.

The list of parameters that are specific to PiCCO is labeled **PiCCO.**

Note: *Some of the parameters that are supported by PiCCO may appear in other lists.*

Table 1 shows the list of parameters that are specific to PiCCO and the location of parameters that are supported by the monitor and appear in the UDC in other lists.

Table 1: PiCCO Parameters

Code	*Description*	*Units*	*UDC list*
CPO	Cardiac Power Output	W	PiCCO
CPI	Cardiac Power Output Index	W/m2	PiCCO
CFI	Cardiac Function Index	1/min	PiCCO
DO2 *	Oxygen Delivery	ml/min	PiCCO
DO2I *^	Oxygen Delivery Index	ml/min/m2	PiCCO
dPmx	Index of Left Ventricular Contractility	mmHg/s	PiCCO
EVLW	Extra-vascular Lung Water	ml	PiCCO
GEDV	Global End-Diastolic Volume	ml	PiCCO
GEDI	Global End-Diastolic Volume Index	ml/m2	PiCCO
GEF	Global Ejection Fraction	%	PiCCO
ITBV	Intrathoracic Blood Volume	ml	PiCCO
ITBI	Intrathoracic Blood Volume Index	ml/m2	PiCCO
PPV	Pulse Pressure Variation	%	PiCCO

Table 1: PiCCO Parameters

Code	*Description*	*Units*	*UDC list*
PVPI	Pulmonary Vascular Permeability Index	No unit	PiCCO
SVV	Stroke Volume Variation	%	PiCCO
ART	Arterial Pressure	mmHG	Vital Signs
SpO2	Oxygen Saturation (Pulse)	%	Vital Signs
ScvO2* ^	Central Venous Oxygen Saturation	%	Vital Signs
CO	Cardiac Output / Thermal dilution	l/min	Vital Signs
CI	Cardiac Index	l/min/m2	Hemodynamics
SV	Stroke Volume	cc	Hemodynamics
SVI	Stroke Volume Index	cc/m2	Hemodynamics
SVR	Systemic Vascular Resistance	dyn*s*cm-5	Hemodynamics
SVRI	Systemic Vascular Resistance Index	dyn*s*cm-5*m2	Hemodynamics
VO2 *	Oxygen Consumption	ml/min	Oxygenation
VO2I * ^	Oxygen Consumption Index	ml/min/m2	Oxygenation

CHAPTER 29:
RADICAL 7 – MASIMO CO-OXIMETER

Overview

Radical 7 is an Optical device with sensor similar to SpO2 sensor that measures:

- Oxygen Saturation (SpO2), PVI, PI
- Methemoglobin Saturation (SpMet®),
- Carboxyhemoglobin Saturation (SpCO®),
- Total Hemoglobin (SpHb®),and
- Oxygen Content (SpOC),

Note: *Refer to Chapter 22: Pulse Oximetry (SpO2), to learn about the operation and use of SpO2 measurement.*

This chapter describes the difference between the standard SpO2 measurement and the SpO2 measurement using Radical 7.

In addition to the standard SpO2 measurement the Radical 7 provides measurement of PVI®),– Pleth Variability Index and PI – Perfusion Index.

The Radical 7 supports the use of standard SpO2 sensor, and require special sensors with multi wavelength to measure the additional blood parameters : SpMet, SpCO, SpHb and SpOC (See table XX for details)

WARNING!!!*Before making decisions on treatment of blood gas, check blood gases using a calibrated Gas Blood Analyzer. Use the monitor alarms and abnormal value as a indication for further check.*

WARNING!!! *The disposable sensors are attached to the skin with adhesive tape – they are contraindicated for patients who exhibit allergicreactions to foam urethane products and/or adhesive tape.*

Radical 7 Accuracy Limitations

- Inaccurate measurements may be caused by venous pulsations.
- Inaccurate measurements or loss of pulse signal may be caused by placement of a sensor on an extremity with a blood pressure cuff, arterial catheter or intravascular line.
- Loss of pulse signal can occur when the sensor is too tight.
- Loss of pulse signal can occur when the patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.
- Loss of pulse signal can occur when there is arterial occlusion proximal to the sensor.
- Loss of pulse signal can occur when the patient is in cardiac arrest or is in shock.

Technical Alarms

Technical alarm messages for Radical 7 are "**Cable Out**" and "**Relocate Probe**". The alarm warnings of the technical problem appear in the following forms:

- Cyan background on the numeric vital sign area.
- Message in the alarm message area
- Audible alarm

Note: *"**Relocate Probe**" is caused by low photo-plethysmographic signal*

Calibration

The Masimo sensors are factory calibrated and do not require calibration.

Monitoring Procedures

SpO2: refer to *Chapter 22: Pulse Oximetry (SpO2)* for general instructions.

For all other parameters the menu is built from

- **Alarm Limits**

Use this panel to activate/deactivate and set low and high alarm limits.

- **Alarm Response**

Use this panel to define how the ***Menntor X7*** responds to detected alarms.

- **Display Options**

Use this panel to define how a parameter values appear on the main screen display.

- **Activate**

Use this panel to activate or de-active monitoring each parameter

Setting SpO2 Alarms limits

SpO2 **Alarm Limits**, allows setting the alarm limits for:

SpO2, Range 0 – 100 % (default 90, 100 %)

PVI , Range 0 – 100 %

PI Range 0 – 20 (arbitrary units)

Setting SpHb Alarm Limits

SpHb **Alarm Limits**, allows setting the alarm limits for:

SpHb Range : 0 – 25 gr/dL (default 7.0, 17.0)

SpOC Range 0 – 100 mL/dL

Setting SpCO Alarm Limits

Spo2 Range 0 – 100 % (default 0, 10)

Setting SpMet Alarm Limits

SpMet Range 0 – 100 % (default 0.0, 3.0)

Display Options

SpO2 can be displayed in Waveform, Big numbers and Secondary.

All other parameters are displayed as Big numbers or Secondary.

Sensors

All original Masimo sensors (LNOP, LNCS and M-LNCS) work on Radical 7.

Sensor categories:

- Masimo SET adhesive and reusable sensors
- Masimo rainbow SET adhesive and reusable sensors
- Masimo ReSposable sensor system

Note:*For detailed information, contact your Masimo representative…*

CHAPTER 30:CEREBRALOGIK- aEEG AND EEG

Introduction

The CerebraLogik system is a Menntor X7 module designed to monitor EEG and display long term Amplitude Integrated EEG (aEEG).

The Menntor X7 monitor uses the CerebraLogik front end amplifier to record two channels of EEG.

The CerebraLogik is a stand alone unit to be attached to a basinet or patient bed. Its interface cable is connected to the UIM input of the monitor, and can be activated via the UIM menu.

The EEG display shows real time EEG with history of EEG compressed as Amplitude Integrated EEG – aEEG, showing 3 hours of EEG.

CAUTION! *It is not allowed to connect the interface cable to any equipment, other than* Menntor X7 *monitors.*

Indications for Use

The intended use of the CerebraLogik is to monitor the state of the brain by acquisition of EEG signals, and display the stored EEG in a compressed form of Amplitude Integrated EEG - aEEG and in conjunction with other clinical data.

WARNING!!! *EEG monitoring is intended for use in hospitals only, and under the direct supervision of a licensed healthcare practitioner trained in its proper use.*

CAUTION! *The dual channel EEG monitoring does not replace full EEG examination.*

WARNING!!! *CerebraLogik is not defibrillator proof; in case of defibrillation; disconnect the EEG electrodes from the CerebraLogik..*

Compliance

Menntor X7 bedside monitor is also designed to comply with the international EMC requirements for medical electrical equipment IEC 60601-1-2

CerebraLogik Storage

CAUTION! *If the CerebraLogik is stored for a long period of time , it is recommended to store it on it's original packaging.*

Icons

The following icons appear on the CerebraLogik adjacent to the electrode input connectors.

Table 30-1: Icons

	Attention, consult accompanying documents (Service to be performed by qualified technician.)
	Type BF applied part
	Refer to instruction manual/ booklet
	Restricts the sale and use of this instrument to qualified medical personnel only.
	Not for use in explosive gas environment
	Electrical and electronic equipment - Dispose according to local regulation
	Date of manufacture
	CE Mark

Patient Safety

Patient safety is assured by double isolation between the EEG input and the electrical power.

The double isolation prevents summation of leakage between the EEG electrodes and other applied parts.

CAUTION! *CerebraLogik is not intended for use during surgery and electro-surgery.*

Figure 30-1: CerebraLogik Module

CerebraLogik is equipped with sockets for 5mm DIN connectors, for use with disposable cup or needle electrodes with wires. Use Grass Safelead Surface or Subdermal needle electrodes or equivalent.

The sockets are marked as Channel 1 (Left)+ ; -, Channel 2 (Right) +; -, REF.

The five sockets build 2 channels of EEG in the following matter: The two Left inputs comprise Channel 1, marked as "Left" and the two Right inputs comprise Channel 2, marked as "Right". Both channels use the REF as a Reference point.

Both channels are differential with high common mode rejection, thus preventing interference from devices such as pacemakers and peripheral stimulators.

Each EEG channel can be displayed on the Menntor X7 together with its corresponding aEEG channel.

Note: *The DIN connectors have protected female plugs, thus preventing the possibility that the plug touchs any conductor other than the CerebraLogik sockets.*

WARNING!!! *Use of electrodes that do not use DIN connectors is forbidden and may jeopardize the patient safety.*

CAUTION! *Conductive parts of ELECTRODES, including the NEUTRAL ELECTRODE, should not come in contact with other conductive parts including earth.*

CerebraLogik Label

CerebraLogik ™
REF 681138010 Rev. A
SN 000000000001
681701138 Rev.A
Rx Only
YYYY-MM
CE 0473
EC REP Charter Kontron Limited.
Unit 18 Avant Business Centre 21 Denbigh Road Milton Keynes MK1 1DT England
Mennen Medical Ltd.
4 Hayarden Street, Yavne, PO Box 102, Rehovot, 76100 Israel
Made in Israel

Figure 30-2: CerebraLogik label

CerebraLogik - Waveforms and Display Modes

Menntor X7 equipped with CerebraLogik, can display two sections for each channel in parallel: real time EEG and aEEG waveforms. The real time EEG is shown under the correlating aEEG of each channel. The aEEG shows up to 3 hours with the current time at the right side of the panel.

During the recording you can see the historical EEG waveforms in parallel as full disclosure of the specific patient in a special "History panel".

The display can be configured in a variety of modes:

- EEG real time waveform display
- EEG real time with aEEG
- Very big numbers with one EEG and aEEG display
- EEG waveform plus one hour aEEG
- EEG and aEEG History panel

Quality Bar and Graph

The EEG signal quality is shown by a vertical quality bar to the right of the EEG waveform. The historical quality is shown on the aEEG panel by a superimposed quality line, with an arbitrary scale of 0 to 5, where zero (0) represents good quality and 5 worst quality or faulty electrode.

Note: *The quality units are equivalent to the effect of electrode impedance used by other vendors as follows:.*

Quality	0	1	2	3	4	5
Impedance	0	< 5 KΩ	5-10 KΩ	10-15 KΩ	15-20 KΩ	>20 KΩ

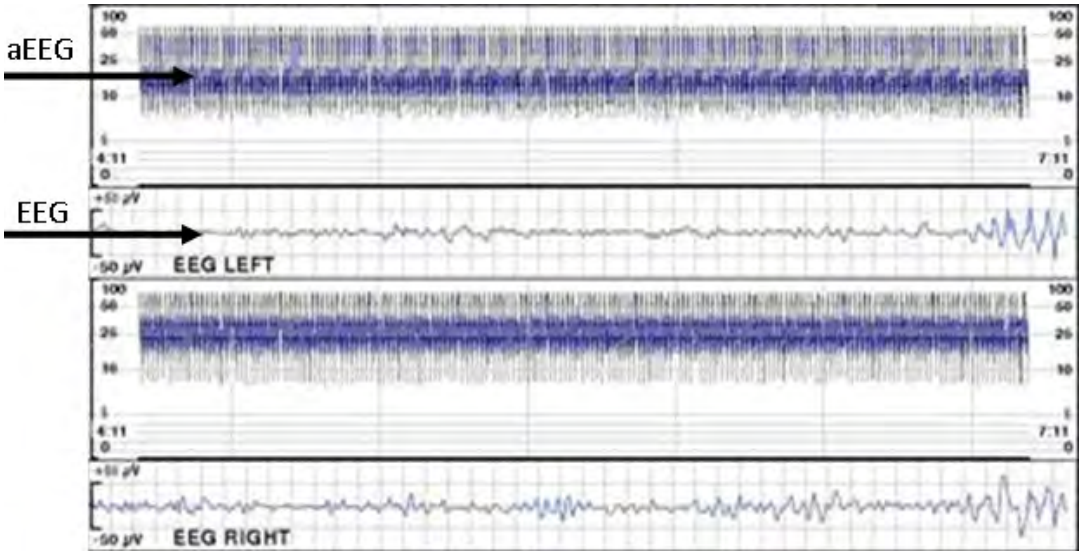


Figure 30-3: aEEG + EEG real time

CerebraLogik Full Disclosure

CerebraLogik records the EEG and aEEG during the entire time the patient is connected to the Menntor X7 and to the CerebraLogik electrodes.

You can export the full data at the end of the procedure or, if desired, sections of CerebraLogik recording can be exported before the patient is dismissed. You can choose the sections manually. See “aEEG History”.

Viewing of the exported data is done on any PC using the *CerebraLogik Viewer* software by Mennen Medical.

Operating Menntor X7 Monitor with CerebraLogik

Preparing for Operation

➤ ***To prepare the CerebraLogik for operation***

1. Connect the CerebraLogik to one of the UIM inputs of the Menntor X7 monitor.
2. From the **Vital Sign**s menu select the relevant UIM channel
3. Select CerebraLogik and activate
4. Attach the EEG scalp electrodes
5. Secure the CerebraLogik to a convenient location near the patient's head using the attachment clip.

Electrode Location

You can place each pair of electrodes, Channel 1 and Channel 2 according to the hospital methodology, or follow El-Dib recommendation for one left and one right location.

The two channels are marked as *(Ch.1) Left* and *(Ch.2) Right*.

You can use either one or both channels, providing that a reference electrode is connected on the scalp.

If two channels are used, a third Cross channel that is the difference between the Left and Right channel is also available for display.

Figure 30-4 shows the electrode location for single or dual channel aEEG as recommended by El-Dib et al (2009)*.

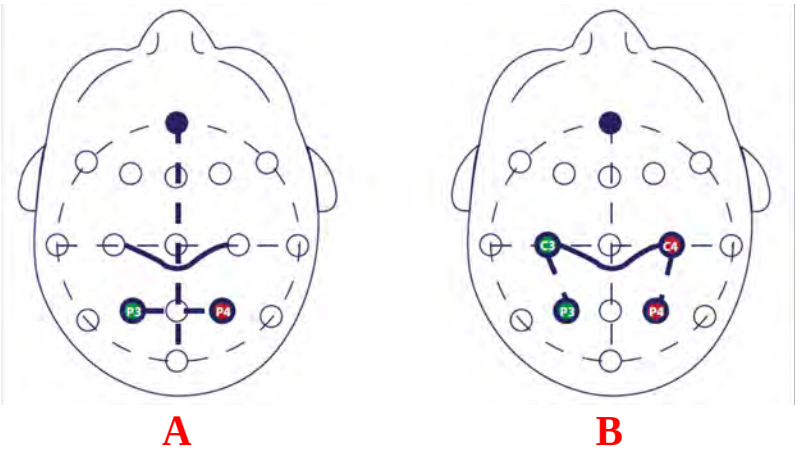


Figure 30-4: Electrode location for aEEG (El-Dib et al (2009). A: Single channel electrode placement (P3-P4); B: Dual Channel Placement (C3-P3 and C4-P4)[1]

Technical Alarm

If any of the electrodes is not connected, a technical alarm is created and the quality bar appears full.

A label with the faulty electrode is presented to the right of the Realtime or History panels.

For example: **EEG Lead L (+) off**, or **EEG Lead R (-)** for the Left positive electrode, or the Right negative electrode failure respectively.

If more than one electrode is not connected or the reference electrode is not connected, the following message is displayed: **EEG Check Electrodes.**

Monitoring Procedures

EEG monitoring is set up through the EEG menu dialog panels. Each dialog panel enables controlling different aspects of EEG monitoring.

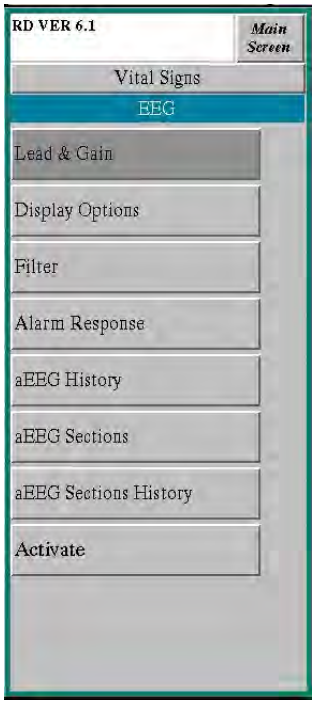


Figure 30-5: EEG menu

1.* El-Dib M, Change T, Tsuchida TN, Clancy RR. Amplitude-Integrated electroencephalograpy in neonates Pediatr Neurol 2009;41: 315-326

The available panels are listed in the following table.

Table 30-2:

Menu Option	*Description*
Lead/Gain	Use this panel to select the required lead and gain for monitoring EEG. See “Setting EEG Leads and Gain”
Display Options	Use this panel to configure the way EEG and aEEG are displayed simultaneously on the main screen. See “Setting EEG and aEEG Display Options”.
Filter	Use this panel to set selected filter for the EEG signal. See “Setting EEG Filters”.
Alarm Response	Use this panel to define the way the *Menntor X7 Series* responds to technical alarm events
aEEG History	Use this panel to view the historical aEEG and EEG at the cursor location ***Note:*** *It is recommended to create a Quickey for aEEG History*
aEEG Sections	A list of aEEG sections, that provides access to section viewing in aEEG Section History, and export of sections to a USB storage device
aEEG Sections History	A panel with aEEG History that allows viewing the pre-selected sections
Activate	Use this key to activate or deactivate EEG monitoring

Setting EEG Leads and Gain

Select the number of EEG channels and the gain for monitoring EEG and aEEG:

- **EEG Channels**: One (1) or two (2) EEG channels can be displayed.
- **Gain** - EEG Gain Control: Select either 10, 20, 50, 70, 100 or 200 μV/cm
- **aEEG Range** : 100 or 200 μV
- **1 -** aEEG # 1 : This is the EEG channel that is displayed as the first (top) lead. toggle between Left, Right or Cross
- **2 -** aEEG # 2 : This is the EEG channel that is displayed as the second (bottom) lead. toggle between Left, Right or Cross

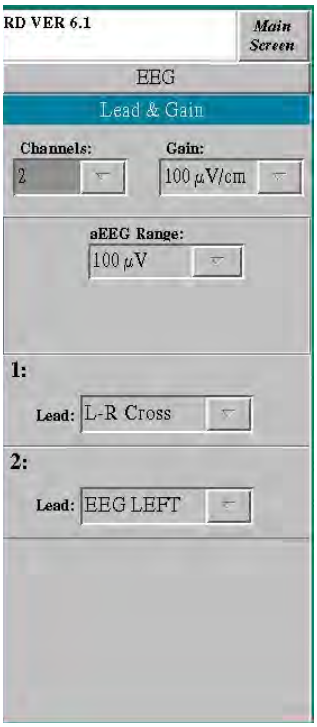


Figure 30-6: Lead & Gain panel

Setting EEG and aEEG Display Options

Set the display options:

- **EEG Sweep Speed**: 15 or 30 mm/sec
- **Show Quality**: toggle between show/hide of the Quality scale.
- **Scale**: toggle between show/hide of the EEG scale
- **Grid**: toggle between show/hide of the EEG grids
- **aEEG mode**: choose EEG to display the EEG waveforms only, or aEEG to display EEG & aEEG simultaneously.
- **Quality Color**– choose the color of the Quality waveform. A full palette is available
- **EEG color** – choose the color of the EEG waveform. Blue or Black is available

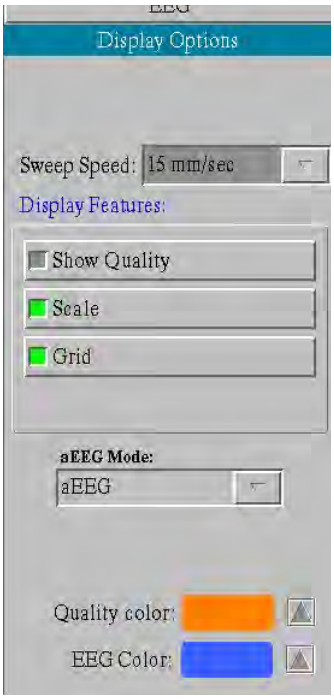


Figure 30-7: Display Option

Setting EEG Filters

- Low pass Filter: 15, 35, 50, 70 Hz
- High pass Filter: 0.5, 1.5 Hz

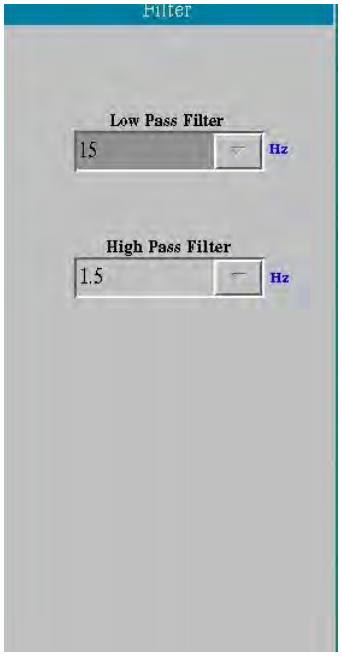


Figure 30-8: Filter

Alarm Response

Tone: toggle

aEEG History

Open the History panel (see “aEEG History”)

aEEG Section

Displays a list of aEEG sections, that provides access for section viewing on aEEG Section History, and export of section to DSD (Disk on Key) storage device

aEEG Section History

A panel similar to aEEG History panel with keys to move from section to section

Activate

Activate or deactivate EEG monitoring

CerebraLogik Display Modes

Menntor X7 equipped with CerebraLogik, can display real time EEG waveforms and historical EEG waveforms in parallel with Amplitude Integrated aEEG real time and history in a variety of modes:

- EEG only, in real time waveform display
- EEG real time parallel with aEEG
- EEG and aEEG History panel
- Very big numbers with one EEG and aEEG display, ECG and two other vital signs
- EEG waveform plus one hour aEEG

EEG only, in real time waveform display

➤ ***To view one or two EEG waveforms without viewing the stored history of the Amplitude Integrated EEG (aEEG)***

1. Select in **Display option**, under aEEG mode: **EEG**
2. Use the **Lead & Gain** menu to view one or two EEG waveforms

   This displays one or two waveforms in parallel with other vital sign waveforms.

Note: *The aEEG History will store the aEEG during this mode of display*

Figure 30-9: Dual channel EEG waveform

EEG Realtime with aEEG

➤ ***To view Realtime EEG with aEEG:***

1. In **Setup menu** select **Display Control.**
2. In **Display Option** select **aEEG**

This displays one or two EEG channels together with aEEG

Note: *Due to space limits, the display of 2 channels can not be achieved if, for example, there are two ECG channels, and other vital signs in big numbers.*

Note: *To view two EEG / aEEG use a single lead ECG display.*

Figure 30-10: Dual channel aEEG real time display

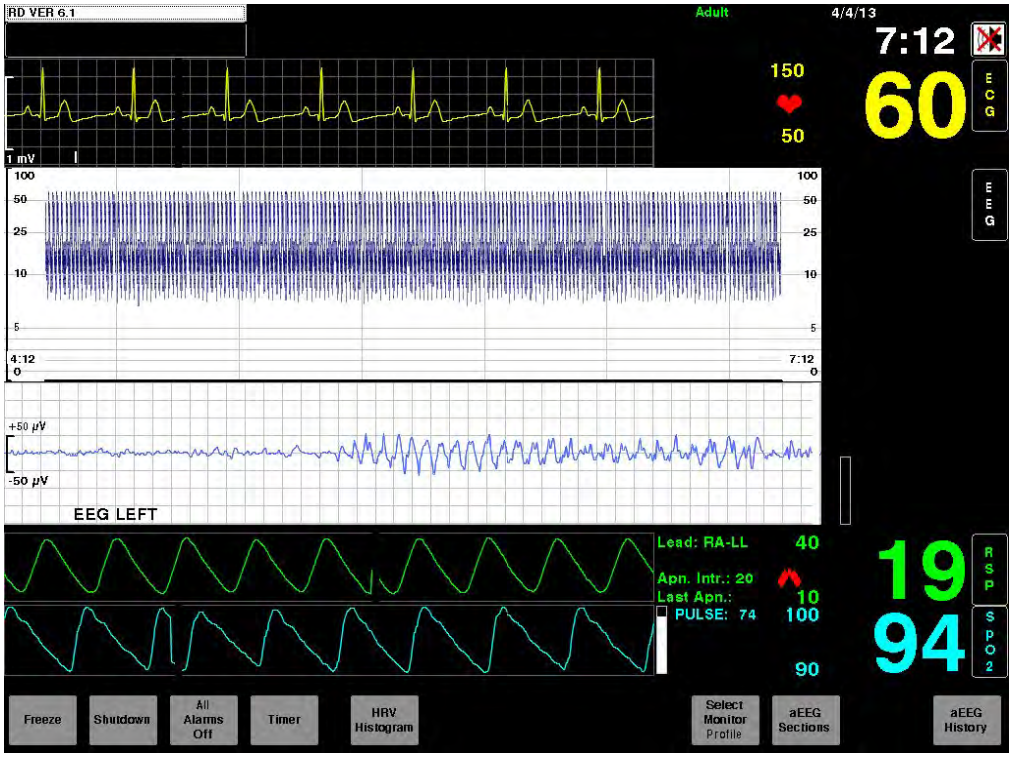


Figure 30-11: Single channel aEEG real time display EEG waveforms plus one hour aEEG

➤ ***To view realtime EEG with an hour trend of aEEG:***

1. In **Setup menu** select **Display Control.**
2. On the **Display Control** activate **WF + Trend display**.
3. From **EEG** menu select **Display Option** and in **aEEG mode display** select **EEG**.

   Realtime EEG is displayed on the waveform part and the last hour of aEEG is displayed in the trend area.

Figure 30-12: EEG + 1hour aEEG

Very Big Numbers with one EEG and aEEG Display

➤ ***To view one EEG and one aEEG in very big numbers display:***

1. In **Setup** menu select **Display Contro**l.
2. On the **Display Control** activate **Very Big Numbers**.
3. In **EEG** menu select **Display Option** and in aEEG mode select **aEEG**.

   One channel of real time EEG + aEEG is displayedabove two VBN boxes

Figure 30-13: aEEG with Very Big Numbers

aEEG History

aEEG History is used to playback EEG and aEEG stored by the monitor.

aEEG History is displayed with one or two channels. The EEG waveform at the location of the cursor is displayed under the relevant aEEG panel.

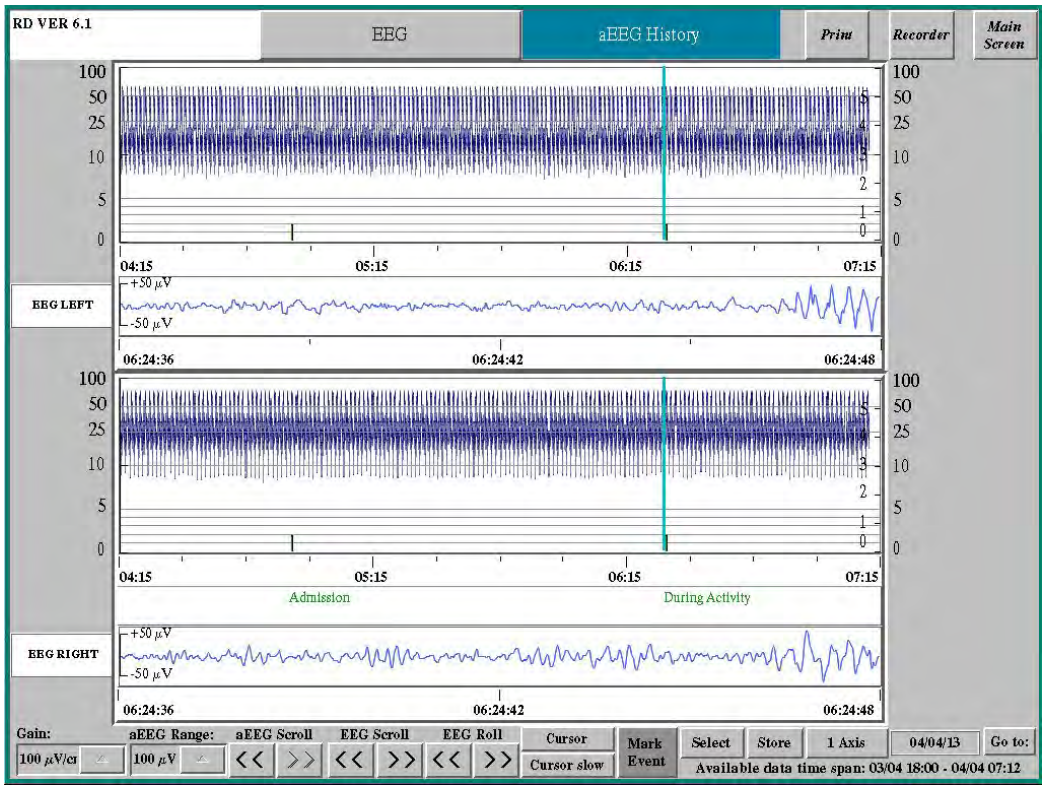


Figure 30-14: Dual channel aEEG playback

➤ ***To open the aEEG History Panel***

1. Open the EEG menu.
2. Click aEEG History.

   The History panel is displayed.

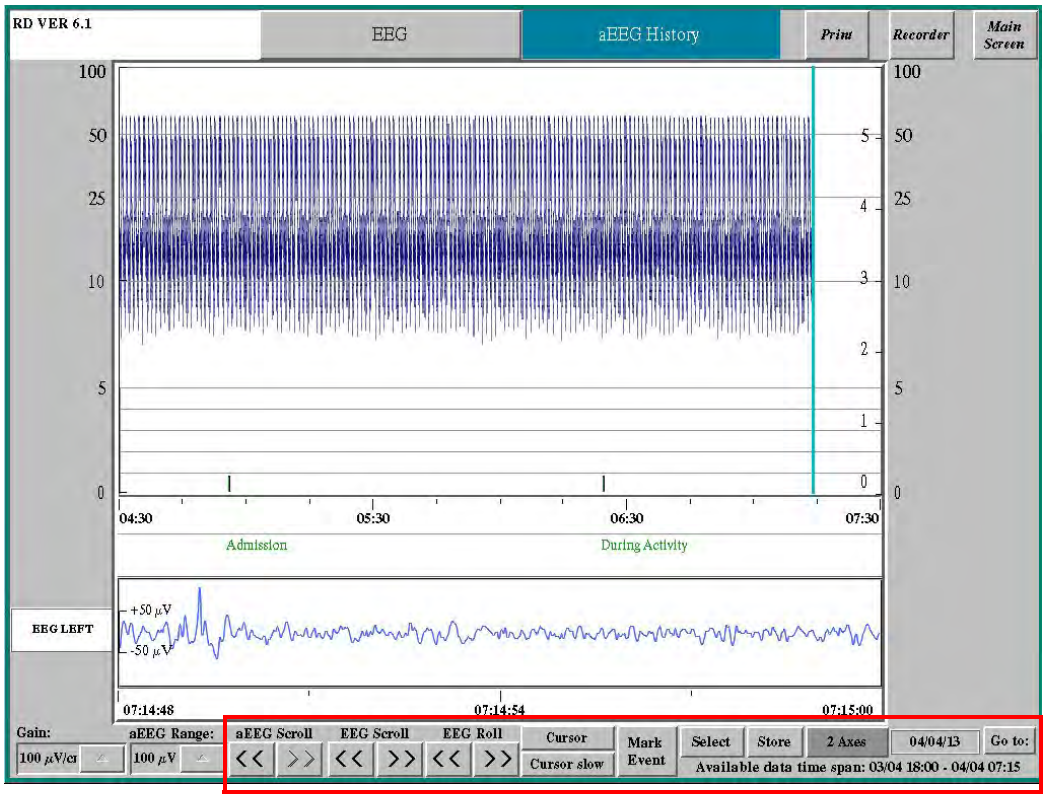


Figure 30-15: Single channel aEEG playback

The following controls are available in the aEEG History Panel (see Figure 30-15:

- **aEEG Scroll** – Scrolls the aEEG in steps of one (1) hour.
- **EEG Scroll** – Scrolls the EEG waveform to the left or to the right in steps of 8 Seconds
- **EEG roll** – rolls the EEG waveform to the left or to the right in steps of 8 seconds.
- **Cursor Slow/Fast** toggle – **Slow** moves the cursor in steps of 12 seconds, **Fast** moves the cursor in steps 2 minutes
- **Cursor** – This enables moving the cursor. Activate this key and rotate the Quicknob to move the cursor. The raw EEG appears at the time location of the cursor.
- **Mark Event** – Inserts an event mark and saves an event strip.
- **Section** – Use this key to store sections of aEEG.

Note: *Under the above keys the available data time span is shown, from the start of monitoring until the current time*

- **Store** – Use this key to store a 3 hour section of aEEG
- **Axis** – Toggles between 1 and 2 channels aEEG & EEG display
- **Date** – Displays the date of the historic aEEG displayed
- **GoTo** – Use this key to open the Date & Time panel, and select the date and time at which the aEEG display will Start.

Note: *This key is dimmed if the history is less than 3 hours*

EEG Sections

You can store aEEG Sections.

➤ ***To mark a section on the aEEG History panel:***

1. Press **Cursor.**
2. Set the cursor to the required start of the section.
3. Select the Section key (Use the Quicknob or the Touch screen)
4. Rotate the Quicknob – This displays a Red cursor, which provides the end time of the section.
5. Click the Quicknob– this sets the section between the Cursor and the Red cursor

   A list of section labels opens.
6. Either select a label *or* Use the Escape key to mark the section as Manual.

Note: *In order to be able to display the section labels, you need to set the Mark Event key in:*
System Setup > Event Setup*, to:*
Chart + Strip + Label*"*

Viewing aEEG Sections

➤ ***To view an aEEG section:***

1. From EEG menu select **aEEG Sections**- This displays a table with list of sections selected during the recording.

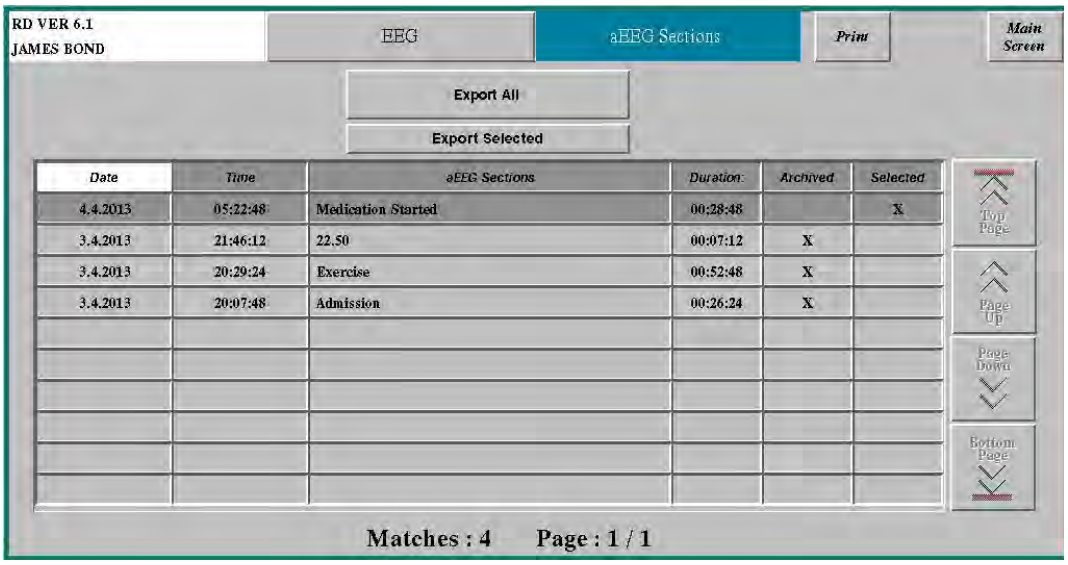


Figure 30-16: Section selection

2. Select a section.

   A window with the following options opens:

   •**Select/Unselect**

   •**aEEG history**

   •**Edit Label** – Edit the section label

   •**Delete** – Delete the section

   •**Trend** – Go to Trend at the start time of the section

   •**Chart** – Go to Chart at the start time of the section

   •**Close**

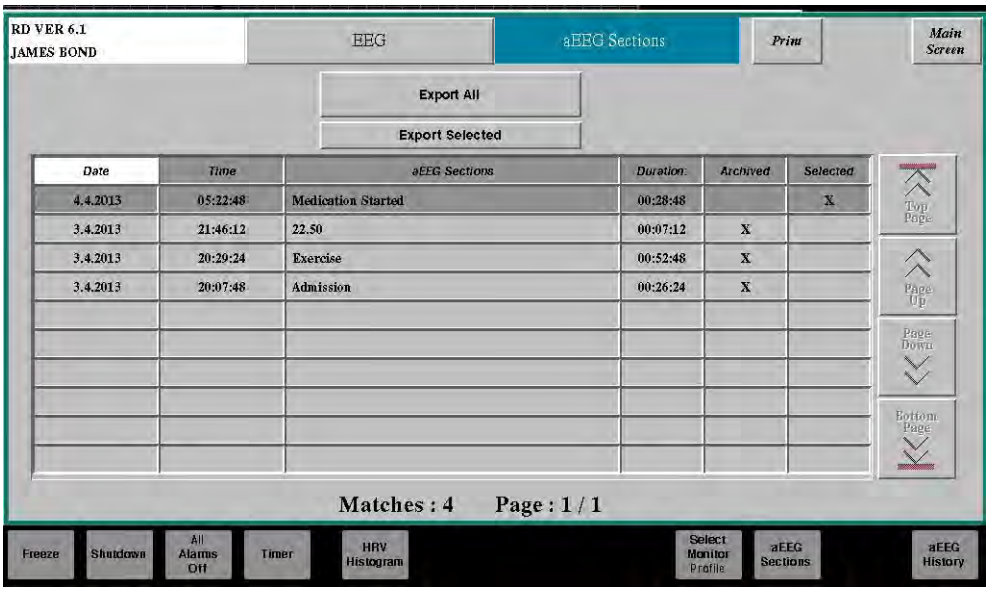


Figure 30-17: aEEG Section panel

Marking Sections Selected / Archived

Use this option to mark sections to be exported to the USB

- An **X** at the "Selected" column means that the section is selected for export to USB.
- An **X** in the "Archived" column means that the section has already been exported to the USB.

aEEG Sections History

Use aEEG History, to go to **aEEG Sections History** Panel.

This panel is almost identical to **aEEG History**, but has keys for viewing Next or Previous sections.

Selection of a section moves the cursor to the start of the Section. The start is marked by blue mark, and the end of the section by red mark.

Use the Next / Previous keys to move from one section to other

Data Storage and Export

CerebraLogik data can be exported to external PC software dedicated for viewing data. In addition to CerebraLogik data, also all data stored in all Menntor X7 monitors can be exported (Waveforms, Full disclosure and Overview, Event Strips, numeric Vital signs (chart) and Alarms).

Exporting to DSD

It is possible to Export patient data to a DSD (Disk on Key) via the USB port.

For Monitored patients it is possible to Export sections of the EEG/aEEG with the numeric Vital Signs (HR, BP, BMP etc.) at the time of the cursor.

Saved and Discharged patient data Export can be performed during monitoring of another patient or when the monitor is at Discontinue or Discharge mode.

CAUTION! *The DSD (disk on key), must be dedicated to CerebraLogik and* Menntor X7 *data. Do not keep on this DSD any other files such as data taken from Window PC systems, Word files, images, video etc.*

Exporting aEEG Sections to DSD or a Network

➤ ***To export aEEG sections:***

1. From **EEG** menu select **aEEG Sections**

   A list of available sections is displayed.

2. Use the Quicknob to click on a section, and use **Select /Unselect** to select the section or sections for Export.

   or

   Press "Export All" to send all sections. This requires entering a password (2334)

Notes: *1. You need a patient name to Export. If Patient Information is missing, a panel opens and requests a patient name.*
*2. If no DSD is connected , a message "**No Disk Present**" appears (figure 29-17)*

Figure 30-18: No Disk

Note: *If a DSD is connected the "**Export Patient Data**" panel with Start and Cancel buttons will appear. (figure 29-18)*

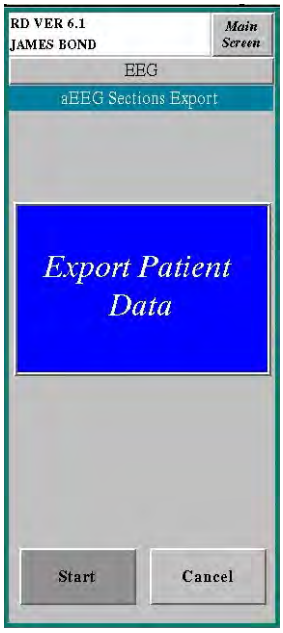


Figure 30-19: Start Export

3. Press **Start.** This sends the data of the selected section to the DSD and show a copying bar with a "Wait" message (Fig 29-19)

Figure 30-20: Export "Wait" message

Exporting Saved patients with aEEG to DSD or Network

➤ ***To export a Saved patient***

1. In Main Menu select: "Export Saved Patient"

   This opens a panel with a list of patients saved on the local monitor/

2. Select a patient.

   A list of options appears:

   •"Export Selected"

   •"Sort By xx"

   •"Close"

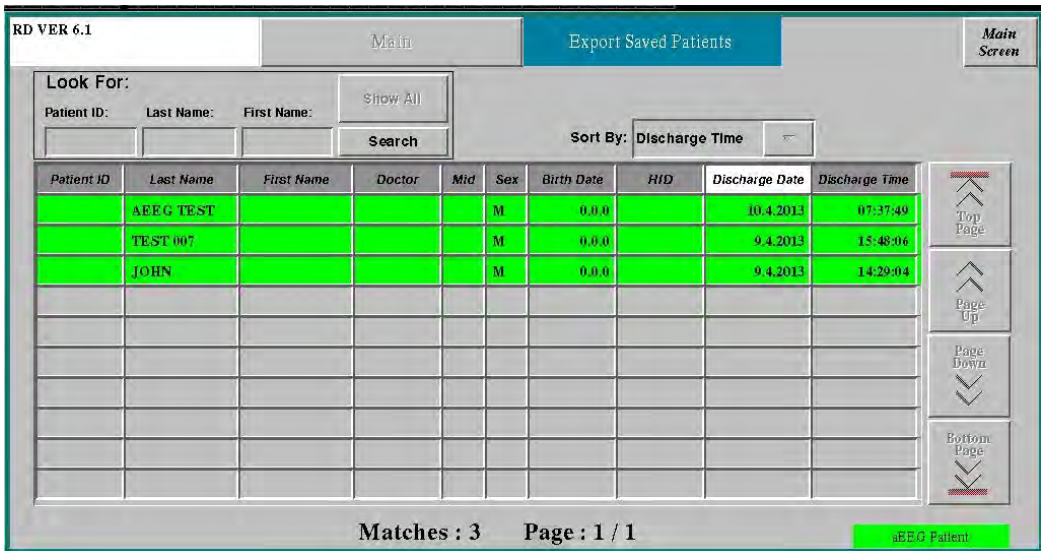


Figure 30-21: Export Saved Patients Panel

3. Press **Export;**you are asked toprovide a password
4. Enter the password (2334).

   If no DSD is connected , a message **No Disk Present** appears (Figure 30-18)

   If a DSD is connected, the **Export Patient Data** panel with *Start* or *Cancel* procedures appear (Figure 30-19)
5. Press **Start**; The data of the selected patient is sent to the DSD and a copying bar with a "Wait" message is displayed (Figure 30-20).

aEEG Viewer

The DSD data can be viewed on a PC equipped with aEEG Viewer software, that is provided to CerebraLogik users, to enable them to view EEG and aEEG data in parallel with the numeric vital signs stored on the DSD.

Recording

Monitors equipped with built in strip chart recorder, enable recording a 3 hour aEEG history and 6 or 12 seconds raw EEG at the time of the cursor.

➤ ***To activate recording:***

1. Open the History panel
2. Select any 3 hours panel of interest and click **Record.**

   The recording consists of four parts, 2 for each channel.

The record label includes: Bed number, Patient ID and name, the EEG channel and the date and time of the recording.

Printing

To print the history panel on a network laser printer, click print on the History panel.

Routine Maintenance

Care and Cleaning

Before each use check the interface cable Integrity.

CAUTION! *Do not use the CerebraLogik if the cable has deteriorated.*

Cleaning

Use soft linen soaked with mild detergent to clean the CerebraLogik

CAUTION! *Do not allow fluids to enter the sockets of the CerebraLogik.*

WARNING!!! *Do not autoclave CerebraLogik. Autoclaving will seriously damage the device .*

Periodic Maintenance

Whenever required, at least once a year.

For monitor periodic maintenance, see *“Calibration and Preventive Maintenance” on page 5-2.*

CHAPTER 31:
TRAIN OF FOUR [TOF]

Introduction

Overview

Menntor X7 monitors can interface with ***TOF-Watch® SX*** by ***Organon***.

Refer to the ***TOF-Watch® SX*** Operator Manual for instruction on the operation of the Stimulator and twitch sensor.

The ***TOF-Watch® SX*** is interfaced with the UIM input of the monitor, using the

TOF Extension Cable, Mennen **PN: 641345092**

The Menntor X7 monitor is used for display and storage of the TOF stimulation response.

Principle of Operation

The ***TOF-Watch® SX*** when used in TOF stimulation mode, provides as a response to the four (4) nerve stimulation, twitches of the thumb.

If the neuromuscular junction is not affected, the four stimulations of the TOF sequence will respond with four full size twitches.

If, however neuromuscular blocking agents are blocking the muscle response, the four twitches will gradually decrease, or less then 4 twitches will be detected.

The ***TOF-Watch® SX*** will show and transmit to the monitor either the percentage of the forth response related to the first response, or the number of twitches 0 to 3, it less then four twitches are detected.

Intended use

From ***TOF-Watch® SX*** Operating manual:

*The **TOF-Watch® SX** is an instrument for monitoring the neuromuscular transmission during surgery or in the intensive care unit by means of acceleromyography.*

Interfacing with TOF-Watch

The interface to the Menntor X7 monitors enables displaying and storing the TOF response in parallel with the other vital signs monitored by the monitor.

The TOF menu provides access to following panels:

- **Display Options**

Use this panel to define if TOF values appear Big Numbers, Secondary or None

- **Alarm Response**

Use this panel to define alarm response by tone.

- **Activate**

Use this panel to activate/deactivate TOF monitoring.

➤ ***To connect to TOF-Watch:***

1. Connect the ***TOF-Watch*** interface cable to the UIM socket of the Menntor X7 monitor
2. In the **Vital Sign** menu, select **UIM** (unassigned).
3. From the UIM list of devices select **TOF-Watch**

The TOF menu provides access to following dialog panels:

TOF Display

Figure 31-1: TOF Display

The TOF display consists of four vertical bars, showing the relative strength of the four twitches, using the first twitch as reference.

The strength of the forth twitch, relative to the first one is presented as percentage. If less than 4 twitches are detected a number between 0 and 3 will be presented in place of the % value.

If 4 twitches are detected but they are too small to calculate percentage the number 4 will appear instead of the percentage.

Physiologically it is expected that the first twitches will be larger that the following beats. If, however, following twitches are larger than the first one, they will appear in red.

Alarms

TOF does not produce clinical alarms.

If there is a communication with the TOF Watch, technical alarms initiated by the TOF Watch are also displayed on the monitor.

Table 31-1: Alarms

Alarm	***Alarm message***	***Source***
TOF Watch not connected	No Cable	Monitor
TOF Watch not functional or off	No Comm	Monitor
Battery empty	Battery low	TOF
Flashing acceleration transducer symbol	Relocate sensor	TOF
Normal mode: Acceleration transducer has been removed.	Relocate sensor	TOF
Calibration mode: Unstable or too low acceleration transducer signal.	Relocate sensor	TOF
Flashing bad surface electrode connection symbol	Relocate electrod	TOF
All modes: Missing or bad electrode connection.	Relocate electrod	TOF
Flashing surface electrode symbol	Relocate electrod	TOF
Flashing bad needle electrode connection symbol	Relocate electrod	TOF
All modes: Missing or bad electrode connection.	Relocate electrod	TOF
Flashing needle electrode symbol	Relocate electrod	TOF
All modes: Skin resistance too high.	Resistance too high	TOF
Both symbols flashing simultaneously	Connect stimulation	TOF

SECTION 5
MODULES

This section contains the following chapters:

1. Chapter 32: Recording and Printing
2. Chapter 33: MX57- MPM as Transport Monitor

Vendor Device	***Interface cable P/N***
Andros 4800 Gas Analyzer	641-345-080
Drager Evita-4 ventilator	641-345-058
Leon Plus	641-345-080
PiCCO	641-345-060
Poet IQ	641-345-085
Radical 7	641- 345-058

3. Chapter 34: Spirometry

CHAPTER 32:
RECORDING AND PRINTING

Introduction

Three devices provide the Menntor X7 printing and strip chart recording capabilities.

- Network printer
- Enscribe network strip chart recorder
- Built-in strip chart recorder (optional)

To use the first two, the monitor has to be connected to the LAN. The Built-in recorder provides recording capabilities to a stand-alone monitor

Activation of recording or printing can be performed from the bedside monitor or sent from the Ensemble Central Nurse Station to the bedside monitor to initiate recording or printing

Network Printer

Mennen Medical monitors supports the following Laser printers:

HP Laser Jet network printers models 4050N, 4200N, 4100N, 4014N and 4015N.

To use a Network Printer use the Network setup sub-menu of System Setup to choose the printer to be used by the monitor (see “Network Setup” on page D-64.)

When installing a new printer refer to Appendix D for printing options:

- Screen capture – Print the display as viewed on the monitor display.
- Patient data – Chart, Trend, ST Watch, Calculation, Full Disclosure, Overview, Event Strip.
- Recordings – Use the Laser printer to print waveforms instead of a Strip Chart recorder.

➤ ***To print a Screen Capture***

1. Select **Main**.
2. Select **Utilities.**
3. Press "**Print**".

A single page is printed.

Note: *Alternatively you can create a "Print" Quickey and press it for a Screen capture.*

➤ ***To print Patient data***

1. On top of each patient data panel use the "Print" key to print the relevant panel

One page print will result for Chart, Trend, ST Watch, Calculation, Full Disclosure, Overview

20 second print (two or four pages) will result for Strip Chart Full Disclosure

➤ ***to print waveform recording***

1. In the **System Setup** menu choose **Recorder Setup** (see “Recorder Setup” on page D-65.) .
2. Set **Output to printer**.

This sends recordings to the Laser printer whenever recording is initiated either by **Recorder** key or as an alarm response.

The number of printed pages depends on the definitions in Recorder setup (see “Recorder Setup” on page D-65.) .

Enscribe – Network Strip Chart Recorder.

The Enscribe records one or two channels of waveforms as set in when selecting the **Recorder Setup** from **System Setup** menu. (see “Recorder Setup” on page D-65.) . To send recordings to the Enscribe set the Network recorder as the target recorder.

➤ ***To activate a Manual recording***

1. Use the hardware Record key

   - or -

   Select **Main** menu
2. Select **Utilities** menu
3. Press **Record**.

Note: *Alternatively you can create a "**Record**" Quickey and press it to activate Manual recording.*

➤ ***To activate Selective Recording***

1. In **Patient Data** menu select **Selective Recording.**

Three options are available

- ECG Multilead – To record a 5 second strip of each ECG lead
- All Waveforms – To record a 5 second strip of the top displayed ECG and all active vital signs waveforms
- Selective Recording – Recording of two user selected waveforms starts when the "**Start**" button is pressed. Recording stops when the the "**Stop**" button is pressed.

➤ ***To set up recording upon an alarm***

1. Select **Alarm Response** in the relevant vital sign (foe example: ECG, SpO2 or BP).
2. In **Alarm Response** panel activate **Record**.

If the alarm is from ECG, this results in a two ECG channel recording or for other vital signs in a two channel recording, the top displayed ECG and the vital sign that created the alarm.

Changing the Enscribe Recorder Paper

The Enscribe network Recorder is connected to the LAN network and can record waveforms sent from monitors on the network.

Figure 32-1: Enscribe Network Recorder

➤ ***To insert a paper roll into the recorder***

1. Press the grey button (top, right). The recorder door opens.

Figure 32-2: Enscribe - Door Open

2. Insert the paper roll with the paper coming from the bottom of the roll.

Figure 32-3: Enscribe Paper roll insertion

3. Pull the paper above the door and close the door (Insert fig Enscribe with paper).

Figure 32-4: Enscribe with paper

4. Pull a short strip of paper. The Enscribe is ready for strip chart recordings.

Built-in Strip Chart Recorder.

The Menntor X7 has an optional Built-in strip chart 3-channel recorder.

It can record three channels of waveforms according to the System Setup (Recorder Setup: see “Recorder Setup” on page D-65.).

To send recordings to the Built-in Recorder set the target recorder to the network recorder (see “Network Setup” on page D-64.).

➤ ***To activate a Manual Recording***

1. Use the hardware Record key

   - or -

   Select **Main** menu

2. Select the **Utilities** menu.
3. Press "**Record**".

Note: *Alternatively you can create a "**Record**" Quickey and press it for Manual recording.*

➤ ***To activate Selective Recording***

1. From the **Patient Data** menu choose **Selective Recording**.

Three options are available

- ECG Multilead – This will result with 5 second strip of each ECG lead
- All Waveforms – This will result with 5 second strip of the top displayed ECG and all active vital signs waveforms
- Selective Recording – Upon "Start" this will result with two user selected waveforms recording and will stop by user activating the "Stop" button

➤ ***To set up recording upon an alarm***

1. Select **Alarm Response** in the relevant vital sign (foe example: ECG, SpO2 or BP).
2. In **Alarm Response** panel activate **Record**.

If the alarm is from ECG, this results in a two ECG channel recording or for other vital signs in a two channel recording, the top displayed ECG and the vital sign that created the alarm.

Changing the Built-in Recorder Paper

The Built-In recorder is found at the right side of the Menntor X7 4x00 monitor

Figure 32-5: Built-in recorder – closed

➤ ***To insert a paper roll into the recorder***

1. Press the green button. The recorder door will open

Figure 32-6: Built-in recorder - Door opened

2. Insert the paper roll with the paper coming from the top of the roll (Insert fig Paper roll insertion).

Figure 32-7: Paper roll insertion

3. Pull the paper above the door and close the door.

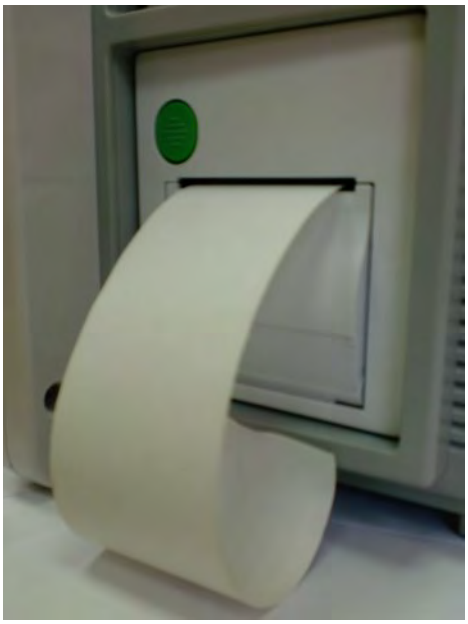


Figure 32-8: Closed door with paper

Closing the door will automatically start the recorder motor and a short strip of paper will come out.

Recorder Status Messages

The following Recorder Status messages appear on the monitor display until a corrective action is taken (or for 2 minutes if no action is taken):

- Recording in Progress
- Recorder Door is Open
- Recorder is Out of Paper
- Recorder is Busy

Pressing the **Silence** key deletes the message

CHAPTER 33:
MX57- MPM AS TRANSPORT MONITOR

Introduction

The Multi Parameter Module - MPM has two models:

- MX57 which is a front-end Multi Parameter Module (MPM), that provides all routinely used vital signs.
- MPM which is an MPM equipped with an LCD display, (see Table 1-2 on page 1-2).

When pulled out of the host Menntor X7, MPM continues monitoring according to the host setup.

The MPM monitor profile is similar to the Very Big Number display mode of the host monitor, independently of the prior monitor profile of the host.

The vital signs, alarm limits, and alarm response are duplicated from the host monitor.

Note: *MPM does not allow changing the profile of the monitored vital signs.*

Figure 33-1 shows the display of the MPM , after it has been pulled out of the host Menntor X7.

Figure 33-1: MX57/D (MPM) out of host

When pulled out of the host Menntor X7, the MPM continues to monitor the patient without interruption and without reconnecting of cables or transducers.

The MPM is equipped with a battery and memory and stores patient vital signs during the transport. It provides data continuity by enabling downloading of the stored patient data when returned to a Menntor X7 host monitor.

General Description

The MX57/D-MPM includes the following:

- 5.7 " LCD display,
- 5 Hardware keys: Silence, Start/Stop NIBP, Zero BP, Mark Event, ON/OFF,
- Battery charged by the host to cover 180 minutes of use out of the host.

When returned to the host Menntor X7 the MPM downloads the data collected during the transport back to the host.

MPM – in Host

While in the host, the MPM stores the following:

- Patient demographic information
- Monitored Vital signs

- ECG and respiration leads
- Alarm limits
- Alarm response
- Patient Type: Adult / Neonatal

MPM – During Transport

For the duration of the transport MPM stores the following:

- Demographics
- All waveforms,
- All numeric VS in 1 second resolution
- Technical and clinical alarms
- RR intervals and QRS shape identification (V, b)
- Arrhythmia
- Event upon alarm – per the alarm response
- Manual Events

MPM Service Messages

The following service messages are displayed according to the system status:

Note:*Themessages and the patient name appears alternately in the same area.*

Message	***Status***
"Alarm Tone Off"	All Alarm Off
" Storage Full "	Memory reached storage limit
"Low Battery"	Battery is nearly empty

Note:*In the battery nearly empty status, the LED at the bottom right flashes red, in addition to the* ***Low Battery*** *message.*

MPM Display Configuration

If the host is in VBN, the vital signs display is duplicated to the MPM (see Figure 33-1).

If the host is in Linear display mode, the VS, numeric and waveform, are entered in the VBN boxes according to the Vital Signs hierarchy in the following sequence: Top-Right, Top-Left. Bottom-Right, Bottom-Left.

Note: *It is not possible to change Vital Signs, Display option, ECG lead or alarm limits on the MPM.*

MPM Display Rotation

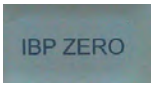
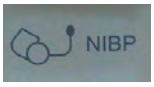
Rotating the MPM changes the display from the horizontal display shown in Figure 33-1 to a vertical display.

Figure 33-2: MPM out of host - Vertical View

Note: *It is possible to disable MPM rotation, in System Setup; this fixes the horizontal view (see Figure 33-1).*

MPM – Hardware Keys Functionality

Table 33-1: Key Functionality

Key	*Function*
	• Press for a short period to silences the alarm for the duration set on the host Menntor X7 and/or toggle the alarm back to sound. • Press for a long period of time to set the alarm and QRS beep permanently to: OFF. • Double-click to toggle the QRS beep: ON/OFF ***CAUTION!*** *There is no Alarm suspension functionality on MPM, only Silence.*
	• Saves an event strip that could later be viewed when the MPM returns to a host monitor.
	• Zeros the invasive pressure transducer, after opening the stopcock to atmosphere.
	• Start/Stop NIBP provides manual activation of NIBP measurement.
	• Switches the MPM power ON or OFF. ***Note:*** *Power OFF deletes the patient name. Power ON starts monitoring with the previous monitor profile, but without any name.*

ON/OFF

Note: *Power OFF deletes the patient name. Power ON starts monitoring with the previous monitor profile, but without any name.*

MPM Operation During Transport

- "ST is not viewed during transport.
- "Arrhythmia alarms are displayed in cases of ASYST, VFIB and VTACH.
- "Artifact Alarms will not be restored during MPM merge.
- ""**All Alarms off**" state is not supported by the MPM. Each parameter has its own alarm set up.

MPM Modes of Operation

The MPM works on it's internal battery, that is charged when the MPM is inserted into the host Menntor X7.

It's battery capacity and data storage, while out of host, is about 5 hours.

The displayed operation modes ot the MPM depend on the Menntor X7 status prior to MPM being pulled out of the host:

- **MPM is pulled out during monitoring**

If pulled out during patient monitoring, the MPM continues monitoring, with Demographic, patient type Adult / Neonatal and monitoring profile set by the host.

- **MPM is pulled out during Discontinue**

If pulled out during Discontinue, the MPM starts monitoring, with Patient Demographic, patient type Adult / Neonatal taken from the host and MPM Default monitoring profile.

- **MPM is pulled out during Discharge**

If pulled out during Discharge, the MPM starts monitoring, with patient type Adult / Neonatal taken from the host and MPM Default monitoring profile.

- **MPM is pulled out during Menntor X7 power off**

The MPM remains in Power OFF mode.

Upon Power ON, the MPM, restarts using the default monitoring profile.

Table 33-2: MPM – Default Profile

Vital Sign	*Alarm Limit*	*Color*	*Setting*
ECG lead II	50 - 150	Yellow	
ECG Filter =			Monitoring
HR source			Automatic
Top-Right: SpO2	90 - 100	Light purple	
Spo2 Sensitivity			Normal
SpO2 response time			6 sec
Top-Left: Respiration	10 - 40	Green	
Resp lead			Lead II
Apnea			Non Function
Bottom-Right: NIBP	Sys 100-150 Dia 50-100 Mean 75-125	Blue	Manual
Bottom-Left: Temp 1	36.0 - 38.0 OC	Purple	

Table 33-2: MPM – Default Profile

Vital Sign	*Alarm Limit*	*Color*	*Setting*
Adult / Neonatal			Adult
Alarm Response			Tone or Event strip
Alarm delay - All VS			5 Seconds

Menntor X7 Messages

MPM is disconnected from the host

The response depends on the status of the MenntoX7 **at the time of disconnection.**

MPM is pulled out during monitoring:

- The host monitor switches to **"Discontinue"** and retains the patient demographic and stored data.
- The host monitor presents the message "**Connect MPM"**.

Note: *The same message is displayed on the Ensemble and Enguard.*

MPM is pulled out during discharge:

- The host monitor presents the message "**Connect MPM"**. The same message is displayedon the Ensemble and Enguard.

MPM returned to host at "Discontinue"

When you insert the MPM, into a host, a panel with information of the last patient stored on the MPM, is displayed. The panel displayes the following information:

- MPM name
- Patient Last name
- Patient First name
- Patient ID

The following figures display the MPM connect information panel under different conditions.

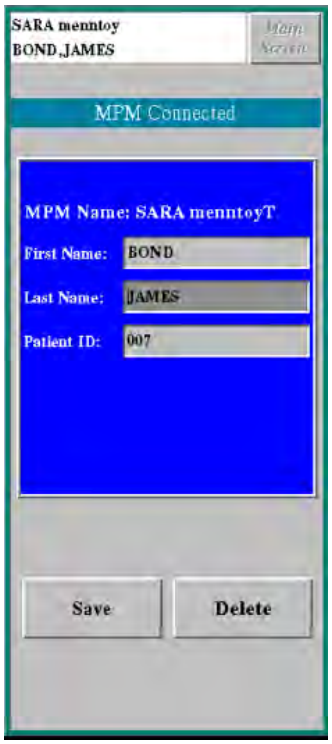


Figure 33-3 a: With name

Figure 33-3 b: No Name

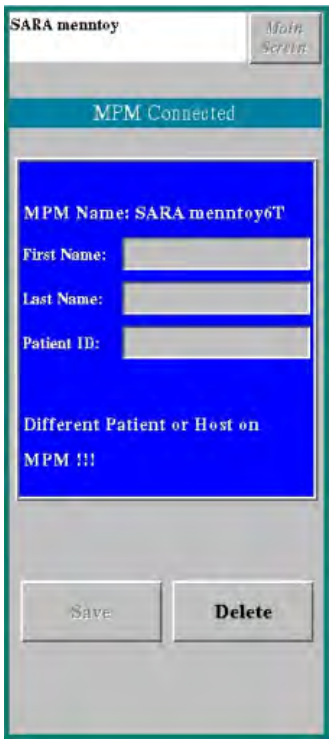


Figure 33-3 c: Different patient or host

You can do one of the following:

- If the MPM came with a name, you can either save the MPM data file or delete it.
- If the MPM has no name but came from the same host, it is possible to enter a name or delete.
- If the MPM came from a different host or has a name different from the host a warning message appears.

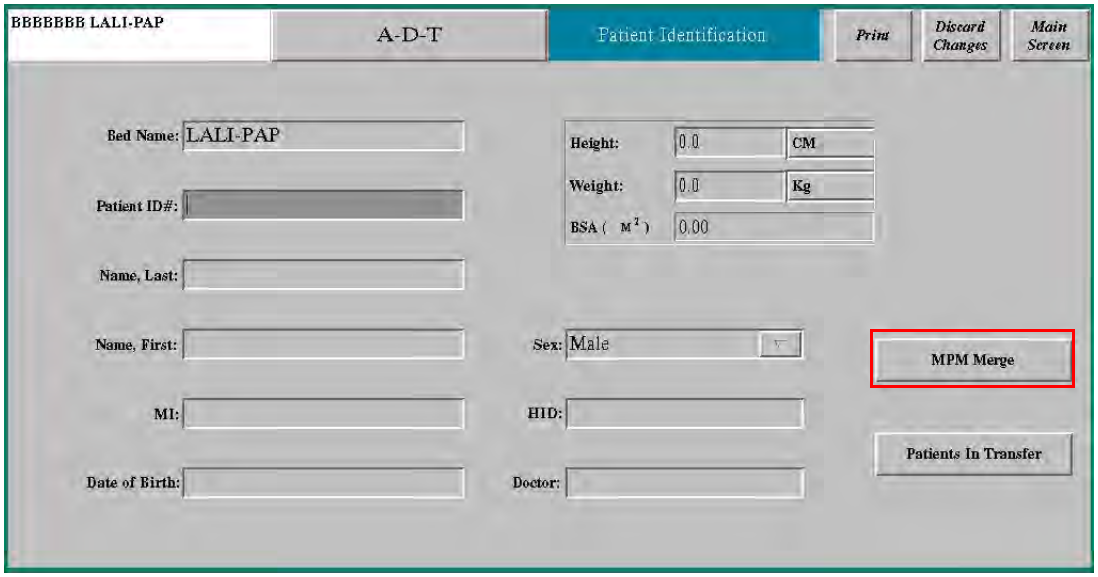
Save starts the MPM downloads, and stored data is copied from the MPN into the host memory, the following message is displayed on the host "MPM in transfer – Do not remove MPM"

If the transfer fails, the message **"Transfer failed, MPM cleared"** appears and the **MPM** memory is cleared/

The data collected on the MPM is stored in the Host under "**Patient MPM Merge**". Up to three files of MPM data can be saved in the monitor. Loading additional files erases the precious files in "Fist in First Out" (FIFO), loop.

➤ ***To access the Merge panel:***

1. From the Main menu select the **Setup** key to display the **Setup** menu. Select **ADT** and then select **Patient Identification**. The *Patient Identification* panel appears.



2. Click **MPM Merge**.The **Patient MPM Merge** panel appears.

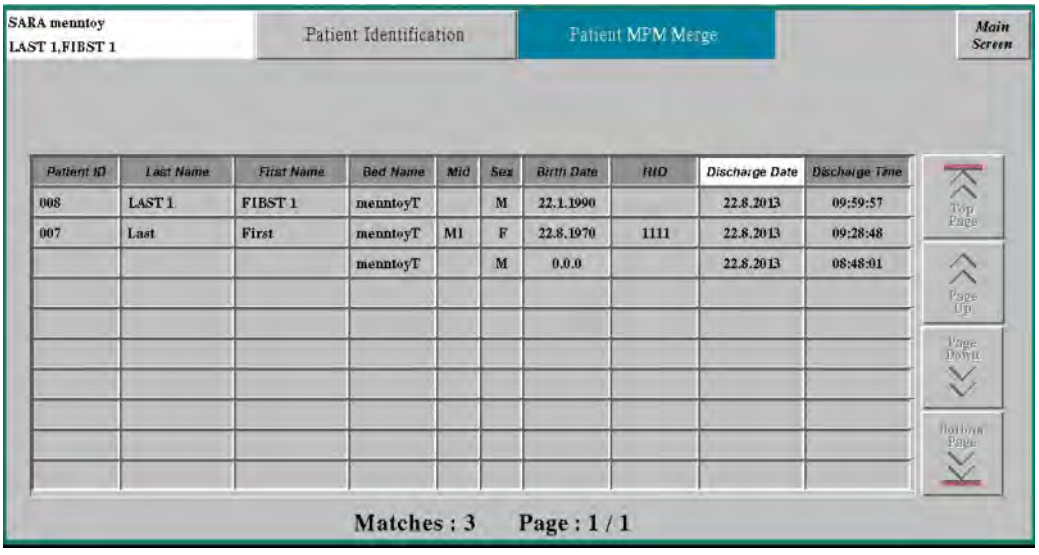

SARA menntoy
LAST 1,FIBST 1
Patient Identification
Patient MPM Merge
Main Screen
Patient ID | Last Name | First Name | Bed Name | Mid | Sex | Birth Date | HID | Discharge Date | Discharge Time
008 | LAST 1 | FIBST 1 | menntoyT | | M | 22.1.1990 | | 22.8.2013 | 09:59:57
007 | Last | First | menntoyT | MI | F | 22.8.1970 | 1111 | 22.8.2013 | 09:28:48
menntoyT | M | 0.0.0 | 22.8.2013 | 08:48:01
Top Page
Page Up
Page Down
Bottom Page
Matches : 3 Page : 1 / 1

Figure 33-4: Patient MPM Merge

3. Select the file you want to merge with the monitored patient.

4. You have now three available options: *Merge*, *Delete*, *Close*.

   - **Merge** merges the MPM save data with the monitored patient data. This overrides the patient name, with the saved MPM name and merges the MPM data with the now monitored data.
   - **Delete** deletes the MPM file.
   - **Close** closes the panel with no action.

Patient Data Chart and MPM

When the MPM is pulled out of the host monitor, the host goes into "Discontinue" mode.

When the MPM is returned to the host, the host waits for " Resume" and then starts monitoring.

The start and end of the discontinuation on the chart is marked by .

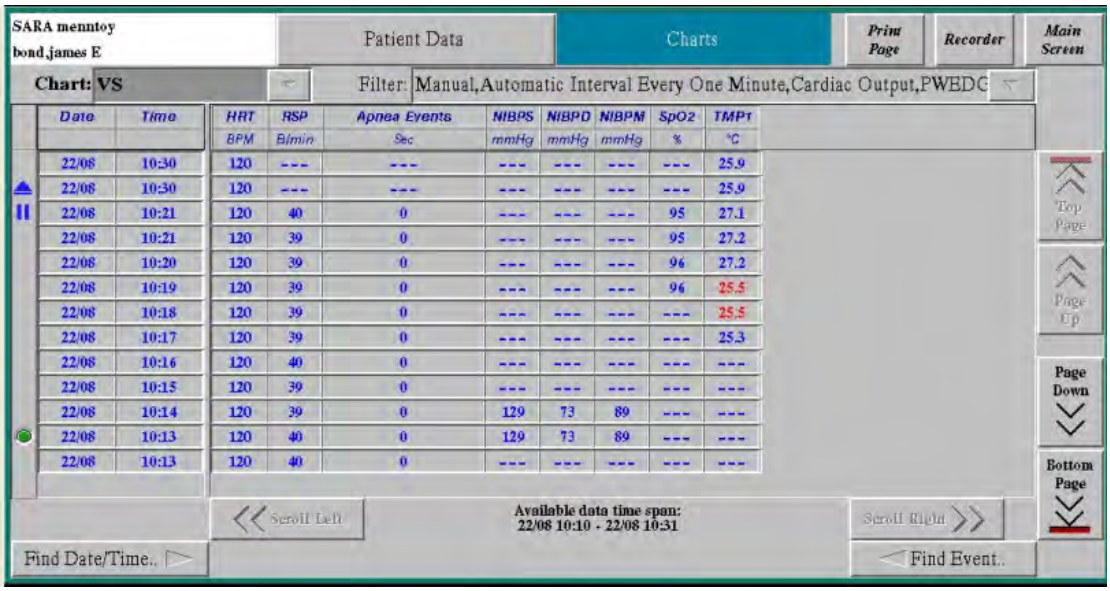

SARA menntoy
bond,james E
Patient Data
Charts
Print Page
Recorder
Main Screen
Chart: VS
Filter: Manual,Automatic Interval Every One Minute,Cardiac Output,PWEDC
Date
Time
HRT BPM
RSP Bimin
Apnea Events Sec
NIBPS mmHg
NIBPD mmHg
NIBPM mmHg
SpO2 %
TMP1 °C
22/08 10:30 120 --- --- --- --- --- --- 25.9
22/08 10:30 120 --- --- --- --- --- --- 25.9
22/08 10:21 120 40 0 --- --- --- 95 27.1
22/08 10:21 120 39 0 --- --- --- 95 27.2
22/08 10:20 120 39 0 --- --- --- 96 27.2
22/08 10:19 120 39 0 --- --- --- 96 25.5
22/08 10:18 120 39 0 --- --- --- --- 25.5
22/08 10:17 120 39 0 --- --- --- --- 25.3
22/08 10:16 120 40 0 --- --- --- --- ---
22/08 10:15 120 39 0 --- --- --- --- ---
22/08 10:14 120 39 0 129 73 89 --- ---
22/08 10:13 120 40 0 129 73 89 --- ---
22/08 10:13 120 40 0 --- --- --- --- ---
Top Page
Page Up
Page Down
Bottom Page
Scroll Left
Available data time span:
22/08 10:10 - 22/08 10:31
Scroll Right
Find Date/Time..
Find Event..

Figure 33-5: Figure 33-4: Chart marked for discontinue

When MPM merge is performed, data stored during the MPM transport between the discontinue and Resume marks is merged.

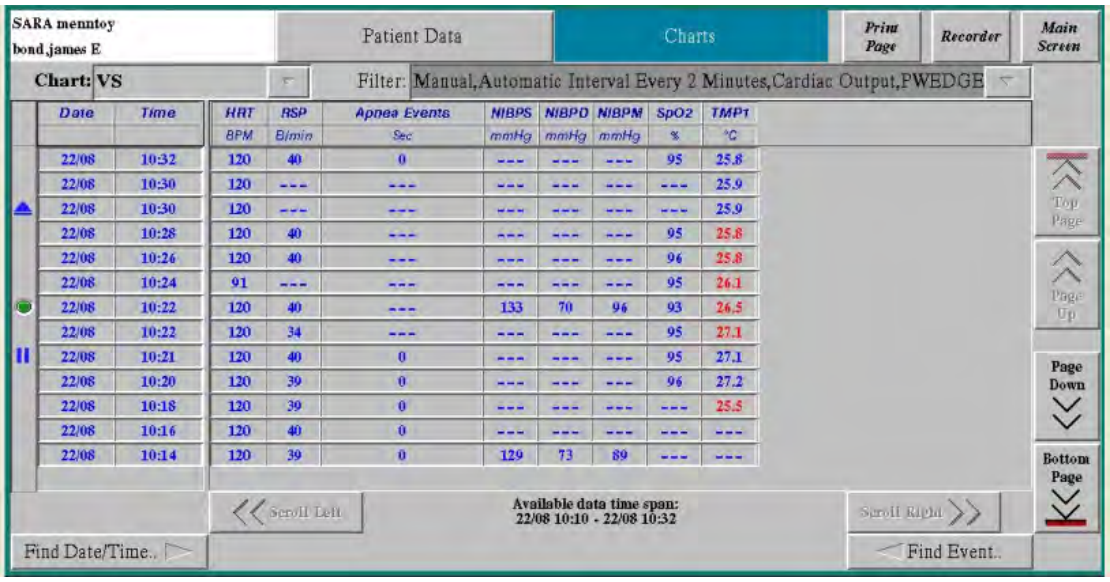

SARA menntoy
bond,james E
Patient Data
Charts
Print Page
Recorder
Main Screen
Chart: VS
Filter: Manual,Automatic Interval Every 2 Minutes,Cardiac Output,PWEDGE
Date
Time
HRT BPM
RSP B/min
Apnea Events Sec
NIBPS mmHg
NIBPD mmHg
NIBPM mmHg
SpO2 %
TMP1 °C
22/08 10:32 120 40 0 --- --- --- 95 25.8
22/08 10:30 120 --- --- --- --- --- --- 25.9
22/08 10:30 120 --- --- --- --- --- --- 25.9
22/08 10:28 120 40 --- --- --- --- 95 25.8
22/08 10:26 120 40 --- --- --- --- 96 25.8
22/08 10:24 91 --- --- --- --- --- 95 26.1
22/08 10:22 120 40 --- 133 70 96 93 26.5
22/08 10:22 120 34 --- --- --- --- 95 27.1
22/08 10:21 120 40 0 --- --- --- 95 27.1
22/08 10:20 120 39 0 --- --- --- 96 27.2
22/08 10:18 120 39 0 --- --- --- --- 25.5
22/08 10:16 120 40 0 --- --- --- --- ---
22/08 10:14 120 39 0 129 73 89 --- ---
Top Page
Page Up
Page Down
Bottom Page
Scroll Left
Available data time span:
22/08 10:10 - 22/08 10:32
Scroll Right
Find Date/Time..
Find Event..

Figure 33-6: Chart after merge

Returning MPM to Host at "Discharge"

When Menntor X7 is in Discharge, the MPM information panel displays only the MPM patient information.

MPM data is stored and the Admit keys are displayed as they werebefore the MPM was pulled out.

IMPORTANT! *To merge MPM data, Menntor X7 must be in Admit mode.*

CHAPTER 34: SPIROMETRY

Overview

The Spirometry module (P/N 751-137-000) of the Mennen Medical Menntor X7 patient bedside monitor, enables monitoring of the flow, volume, airway pressure and lung mechanic parameters.

The Spirometry module is intended for use in the hospital clinical environment only (e.g. in the RICU). The module is used for the continuous monitoring of mechanically ventilated **adult** and **pediatric** patients; or for **adult** and **pediatric** patients able to breathe spontaneously. In both cases, breathing is via a tracheal tube or mask. The module is to be used only for patients with tidal volumes greater than 100 ml.

The basic application of the Spirometry module is to provide a display of the Respiratory Mechanics waveforms and loops on the Menntor X7 patient monitor, if they are not displayed on an external Ventilator. In addition, the Menntor X7 can store the spirometry parameters and clinical data in “Charts” and “Trends” together with the patient data of other vital signs measured by the Menntor X7 monitor. The user can thereby determine the correlation between the respiration mechanics data and the data of other vital signs.

Note: *The user has the choice of activating or disabling alarms for the Spirometry module. The user can set the alarm limits and the alarm response via the alarm limits and the alarm response panels of the Spirometry module.*

Spirometry is measured by means of a device called "Pneumotachograph" that converts air flow into pressure gradient and enables the recording of air flow to and from the lungs. For continuous Spirometry monitoring, we use a disposable plastic tube with some resistance to air flow. The pressure drop on the resistance is related to the air flow. The air volume signal is received by integration of the air flow signal. In parallel, also the airway pressure is measured in the mouth side of he Pneumotachograph.

The Menntor X7 Spirometry module uses a disposable Pneumotachograph sensor that is connected to the module via two air tubes.

There are two transducers in the module:

- A differential transducer that measures the pressure drop on the pneumotachograph and
- A transducer that measures the airway pressure.

For long term monitoring, the Menntor X7 uses a built in Purge pump for periodic removal of water droplets collected in the two air tubes.

Principles of Operation

The Menntor X7 spirometry module uses OEM flow sensor technology developed by CPT; this technology is based upon a fixed orifice, differential pressure approach to flow measurement. The airway adapter flow sensor creates a slight resistance to the patient's respiratory flows. This resistance causes a pressure drop that is relative to the flow rate. Both this pressure drop and the overall airway pressure are measured to calculate the numeric parameters and create the graphics loops and waveforms.
An internal barometric pressure transducer automatically compensates for ambient barometric pressure and altitude changes.

The pressure transducers are automatically calibrated without user intervention. This automatic calibration briefly, less than one second, interrupts patient monitoring. This function is needed due to changes in monitor temperature and position.

The Menntor X7 spirometry module employs a pump and purge system to keep the tubing clear, allowing for continuous usage. The system is entirely free of any user calibration.

The Spirometry module produces three waveform signals:

- Air flow
- Air volume
- Airway pressure

The module measures a set of numeric parameters that evaluate the respiration function. The module monitors respiratory mechanic continuously in both spontaneous respiration and during artificial ventilation.

WARNING!!! *Read the following chapters of the Menntor X7 User Manual before using the Spirometry module:*

Chapter 2: Warnings and Precautions

Chapter 4: Installation and Setup

Chapter 5: Maintenance and Cleaning

Chapter 8: Alarms (for general information about the Menntor X7 VS Alarms.)

In particular, note the following Caution and Warnings:

CAUTION! *Federal law restricts this device to sale by or on the order of qualified medical personnel only.*

WARNING!!! *Do not use this device in the presence of flammable anesthetics.*

WARNING!!! *Do not use this device in the presence of magnetic resonance imaging, MRI, equipment.*

WARNING!!! *The Menntor X7 Spirometry module is intended to be used for the continuous monitoring of pulmonary mechanics of* ***adult*** *and* ***pediatric*** *patients; it is not intended to replace a comprehensive diagnosis of pulmonary function.*

WARNING!!! *To prevent electrical shock hazard, only qualified service personnel should open the module and/or the Menntor X7 patient monitor.*

WARNING!!! *Do not submerse the Menntor X7 Spirometry module at any time. Appropriate cleaning is done by wiping the unit down with disinfectant solution.*

WARNING!!! *Use of the Menntor X7 Spirometry module in the presence of high concentrations of oxygen, helium-oxygen mixtures and anesthetic agents may cause errors in the reported flow measurement.*

CAUTION! *The flow sensor/airway adapter is disposable and for* ***single patient use only.***

CAUTION! *The Menntor X7 monitor can display respiration numeric parameters from the Spirometry module or from a UIM (Universal Interface Module) that interfaces with an external OEM Ventilator. If both the Spirometry module and the Ventilator interface are activated simultaneously, then the spirometry waveforms and loops are generated by the Spirometry module, while the numeric parameters come from the Ventilator. In this case, the table of parameters is marked as "Vent" and not as "Spiro".*

Spirometry Module

The single-width Spirometry module continuously monitors the respiratory mechanics of the patient.

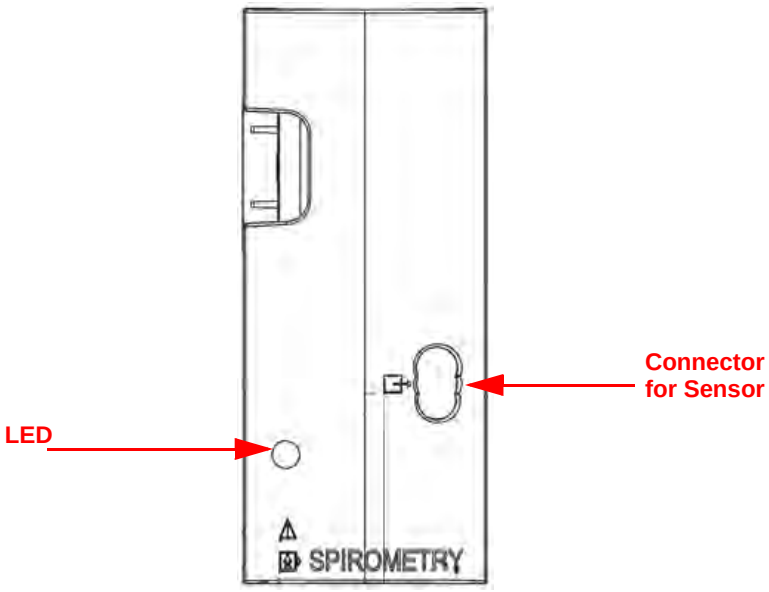


Figure 34-1: Front Panel of the Spirometry Module

Monitor and Patient Connection

A single-patient, disposable flow sensor, 15 mm airway adapter made of plastic, connects the patient to the Menntor X7 spirometer module. Mennen Medical uses an OEM sensor with the trade name: EZ-Flow™ flow sensor.

Note: The term “flow sensor” is used interchangeably with “airway adapter”.

The spirometry sensor depicted below consists of the Pneumotachograph and a triple tube that connects the sensor to the module.

Figure 34-2: Flow sensor/air adapter

The sensor is classified as a fixed orifice, differential pressure device.
The EZ-Flow™ flow sensor is connected in series to the ventilation tubing and the

patient tubing; and is joined to the module via a set of three tubes. There is no conductive connection between the patient and the Menntor X7 Spirometry module.

Flow sensor to monitor

Connect the sensor tubing to the Spirometry module before placing the airway adapter in the patient ventilation circuit. The end of the triple lumen tube of the sensor fits into the triple connector of the module shown in Figure 34-1.
Insert the blue tube in the larger port for proper tubing placing.
Once the tubing is aligned correctly, firmly press tubing into the connector.

Flow Sensor to patient circuit

➤ ***To start monitoring the pulmonary mechanics (spirometry) of a ventilated patient***

1. Disconnect the flex tube of the patient from the wye tube of the ventilator
2. Insert the flow sensor between the patient tube and and the ventilator tube
3. Orient the tubing of the airway adapter upward in order to minimize moisture and secretions in the adapter and tubing as shown in the figure below:

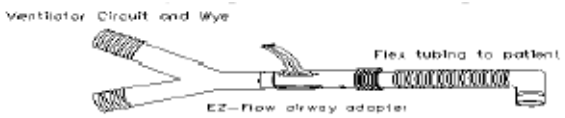


Figure 34-3: Adapter/Flow sensor to patient circuit

CAUTION! *During the insertion of the flow sensor into the breathing circuit, the patient is not ventilated. Perform this procedure as quickly as possible.*

Monitoring Procedures

The Spirometry module provides access to the following five monitoring items:

- Air Flow
- Air Volume
- Airway Pressure
- Loops
- Spirometry Calculated parameters

Air flow, Air volume and Airway pressure are displayed in waveforms plus numeric values.

Loops include some numeric parameters. The Spirometry table shows all or part of the numeric vital signs as selected by the user.You can open one or more (up to all) of the items related to the Spirometry module.

Screen Captures of Spirometry displays:

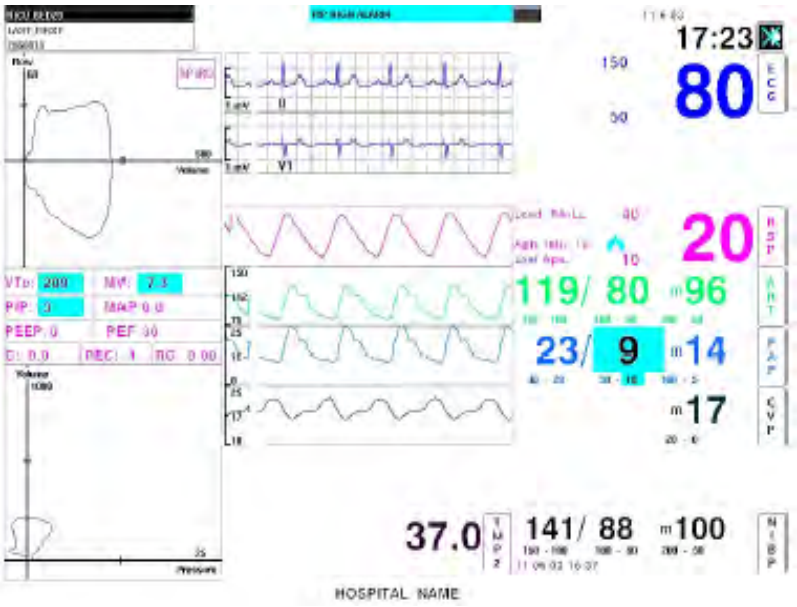


Figure 34-4: Spirometry Loop display on Menntor X7

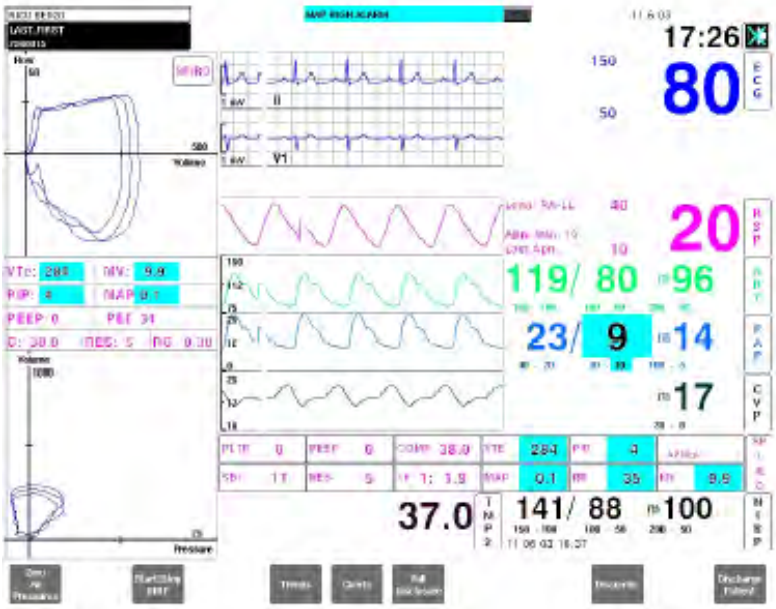


Figure 34-5: Spirometry Loop and Table on Menntor X7

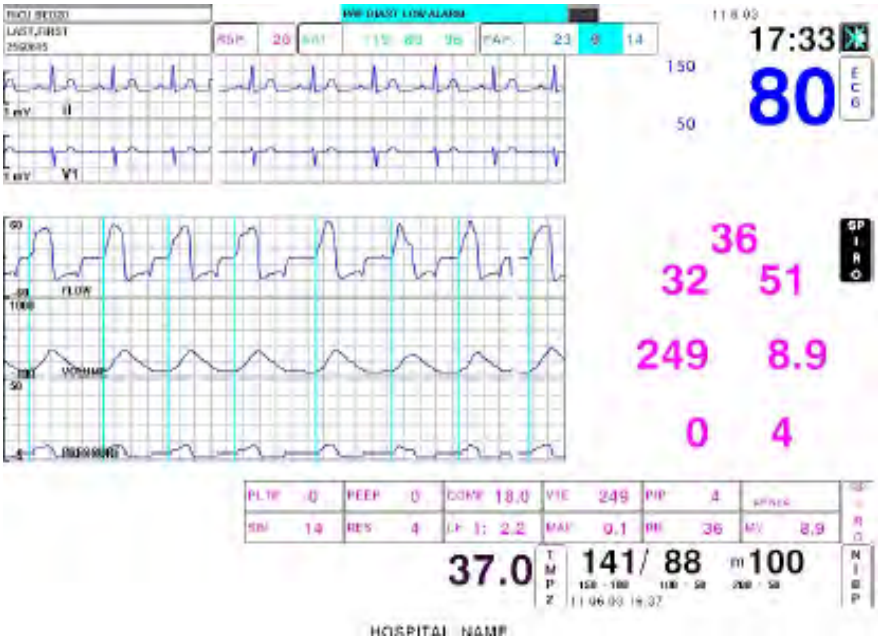


Figure 34-6: Spirometry Waveform and Table display on Menntor X7

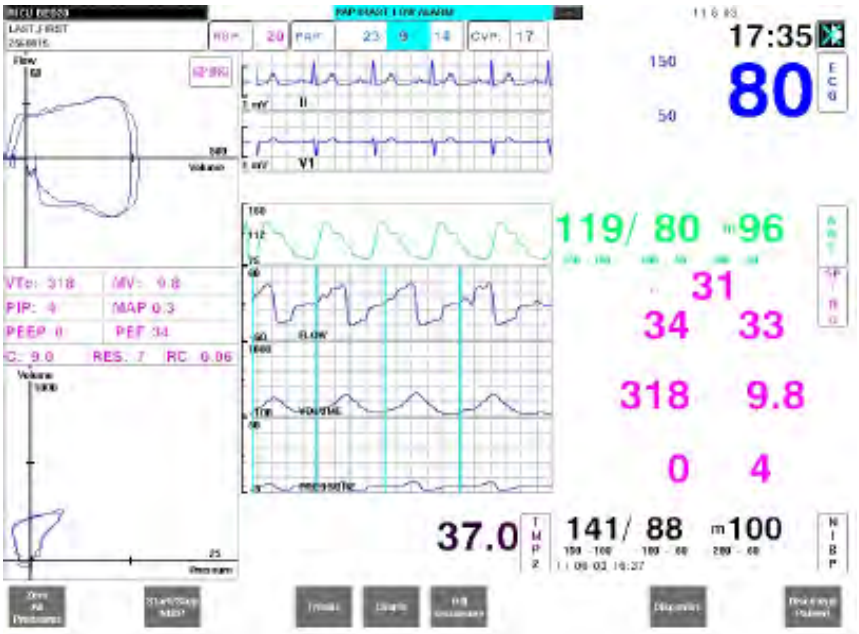


Figure 34-7: Spirometry Loop and Waveform Display on Menntor X7

➤ ***To start monitoring Air Flow, Air Volume or Airway Pressure***

1. Connect the patient sensor
2. Enter Vital Sign menu

The Spirometry Menu

You can access the **Spirometry** menu from the from the **Main Screen** display or from the Menntor X7 **Vital Signs** menu.

To access the Spirometry panel from the Main Screen display:

Turn the QuicKnob until the Spirometry parameter key is highlighted and press the QuicKnob in order to access the Spirometry panel.

➤ ***To access the Spirometry menu from the Vital Signs menu:***

1. On the front panel, press the Vital Signs fixed key. The Vital Signs menu is displayed.
2. From the Vital Signs menu, select **Spirometry**.

The **Spirometry** menu appears, with the following items:

- **Show Loop**

Use this key to show or hide Spirometry loops.

- **Show WF**

Use this key to show or hide Spirometry waveforms.

- **Show Table**

Use this key to show or hide Spirometry VS Table (VS = Vital signs)

Note: *If the Ventilator interface is activated, then the "Show Table" key is dimmed and cannot be used.*

- **Full Panel Loop**

Use this key to display a Full Panel loop.

- **Set Loop**

Use this key to set the loops to be displayed.

- **Set WF**

Use this key to set the waveforms to be displayed.

- **Set Table**

Use this key to set the Spirometry Table.

- **Alarm Limits**

Use this key to activate/deactivate Spirometry alarms and define Spirometry alarm limits.

- **Alarm Response**

Use this panel to define alarm response by tone or recording.

- **Purge**

Use this key to activate the purge pump.

- **Activate**

Use this key to activate/deactivate Spirometry monitoring.

Acessing the Spirometry Menu Items

Full panel Loop

➤ ***To access the Full panel loop:***

1. Select Full panel loop from the Spirometry menu in order to display the spirometry loops on the full panel
2. The display has a time-out of two minutes or;
3. Press Main Screen to return to close the **Full panel loop**

Set Loop

To access the Set Loop panel:

1. Select **Set Loop** from the Spirometry **Display Option** menu in order to display the **Loop** control panel. One or two loops can be displayed simultaneously from three options:
   – Flow – Volume
   – Pressure – Volume
   – Flow – Pressure

The loops overlap and are “refreshed” after 1 to 20 respiratory cycles.

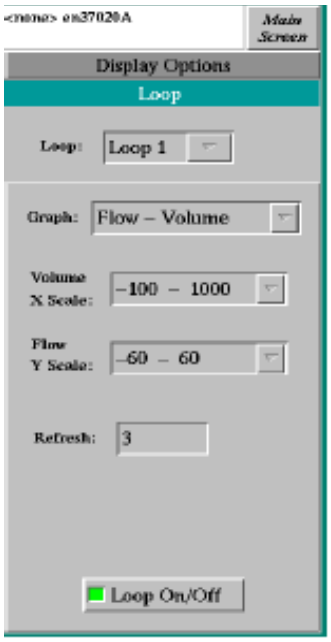


Figure 34-8: Display Options: Loop

2. Select **Loop 1** and select the required loop.
   The Default is: “Flow – Volume”
3. Set the required scales
4. Set the number of respiratory cycles refresh : The Default is “3”
5. Select **Loop 2** and select the required loop.
   The Default is : “Pressure – Volume”
6. Set the required scales
7. Set the number of respiratory cycles refresh : The Default is “3”

Set WF

➤ ***To access the Set WF panel:***

1. Select Set WF from the Spirometry menu in order to display the Set WF control panel.
2. Set the sweep speed - the default is 6.25 mm/s.
3. Select the following display features:
   – Grid
   – Breath symbol

The color “green” in the display features indicates “active”; grey indicates “inactive”.

4. Select the number of channels you want to display, from 1 to 3.
5. Set the waveform parameters and colors for channels 1 to 3.
6. Set the scales for channels 1 to 3; or use auto-scale.

The following parameters are displayed with the waveforms:

			RR	
Air Flow	+	Numeric:	PEF,	PIF,
Air Volume	+	Numeric:	VT,	MV,
Airway Pressure	+	Numeric	PIP,	PEEP

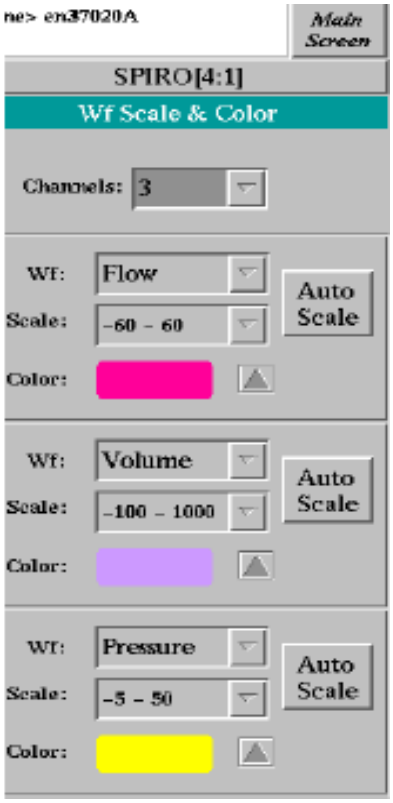


Figure 34-9: Waveform Scale and Color Display

Set Table

Setting the parameters on the **VS Table** panel enables you to do the following:

1. To select the cell size for display of Spirometry information in one of the following sizes: Quarter, Half or Full size.

2. To define the color of Spirometry values as they are displayed on the screen. All values and associated parameters have the same color unless they go into alarm, in which case the value takes on the alarm priority color. When the alarm condition terminates, the original color is restored.
3. To select the cells to be displayed - by default, all Spirometry parameters are displayed.

➤ ***To access the Set Table:***

1. Select **Set Table** from the Spirometry menu - the **VS Table** panel opens.
2. From the **VS Table** panel, select the parameters that you wish to display and press **Done**.
3. From the Cell Size, select the size of the data display numbers. The spirometry data is displayed on the lower part of the displayed on screen. The options are:
   – Quarter, Half and Full. Numbers.
4. From the **Vent Color** list, select the color required for Spirometry parameters. You have a choice of 16 colors.
5. Press **Main Screen** to return to the main screen display.

Alarm Limits

You can set the Spirometry alarm parameters in two dialog panels: **Alarm Limits** and **Alarm Response** - each dialog panel controls a different aspect of Spirometry alarms.

Note: *See "Chapter 8: Alarms" for more details on how to set up* ***Alarms*** *in the Menntor X7.*

- ***Setting Spirometry Alarm Limits***

The Alarm Limits dialog panel controls activation and deactivation of Spirometry alarms and defines Spirometry alarm limits. Low and high alarm limits are set separately for each parameter selected.

The Spirometry Module detects alarms and notifies the Menntor X7 accordingly to display the appropriate message.

By configuring the spirometry parameters on this panel (see below for a list of the parameters), you can do the following:

- Activate or deactivate all Spirometry alarms.
- Set Low and High Spirometry alarms.
- Set Low and High Spirometry alarms to default values.

Spirometry Parameters

The following parameters can be selected:

- RR - Respiration Rate
- VT - Tidal Volume
- MV - Minute Volume
- PIP - Peak Inspiration Pressure
- MAP - Mean Airway Pressure
- PEEP - Positive End Expiratory Pressure
- RES - Resistance
- COMP - Compliance
- PLTP - Plateau Pressure

CAUTION! *Airway Resistance is measured by means of the following formula:*
RES = (PIP – Pplat) / PIF.
You can measure "Pplat" with a ventilator procedure that closes the airway at the end of the inspirium. If this procedure is not performed, "Pplat" will be equal to zero ("Pplat" = 0).
The spirometry module will estimate the airway resistance by applying the same formula with the "Pplat" value equal to zero. The resultant formula is thus: RES = PIP/PIF. The user should note that under this condition, "RES" is an estimate and not a correct value.

➤ ***To access Spirometry Alarm Limits:***

1. Select **Alarm Limits** from the Spirometry menu, .
2. From the Select Type drop-down list, select the type of Spirometry parameter for which you want to set alarm limits.
3. Select the **All Alarms** checkbox to activate or deactivate both high and low limit alarms. When deactivated, the alarm detection is disabled and the slider is disabled

   –or–

   Select the Enable Alarm checkbox located below the Low or High Limit. alarm scale to activate detection of that alarm limit.
4. Using the **QuicKnob**, set the left marker on the slider bar to the required high alarm limit for the current Spirometry parameter, then set the right marker to

the required low alarm limit.
These limits are displayed in the High and Low Limit value areas on the panel.

–or–

Press **Auto Set to Defaults** to automatically set alarm limits to default values.

5. Press **Main Screen** to return to the main screen display.

Alarm Response

The **Alarm Response** panel controls the way the Menntor X7 responds to Spirometry alarms for each parameter type.

The panel is divided into three areas:

– • **Parameter Type** selection, where the parameter to be set is selected.

– • **Alarms**, where response preferences are set for clinical alarms

– • **Fault**, where preferences are set for technical alarms.

➤ ***To access the Alarm Response panel:***

1. Select **Alarm Response f**rom the Spirometry menu . The **Alarm Response** panel appears. Under **Parameter Type Selection**, choose the parameter to be set.
2. Under **Spirometry Alarms**:
   – Select the **Record** checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.
   – Select the Tones checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
3. Under **Spirometry Fault**:
   (i) Select the Record checkbox to activate or deactivate recording of the patient's condition during the alarm event. By default, the checkbox is deactivated.
   (ii) Select the Tones checkbox to activate or deactivate audible alarms. By default, the checkbox is activated.
4. Press **Main Screen** to return to the main screen display.

Purge

The purge pump is automatically activated every 5 minutes.
You can also manually activate the purge pump.

➤ ***To access the Purge pump:***

Select **Purge** from the Spirometry menu in order to activate the purge pump.

WARNING!!! *If water droplets enter the measuring tubes of the sensor, the flow measurement is affected. Use the manual purge to remove water from the tubes. Yopu can use "Purge" from the Spirometry menu, or create a Purge Quickey.*

Note: *The vital signs in the waveform areas are duplicates of the values in the table.*

Note: *Alarm limits ranges and defaults will be the same as in Spirometry.*
PEF and PIF, have no alarms and thus no alarm limits
If an external Ventilator is in use, the dispalyed numeric parameters (vital signs) are those measured by the Ventilator.

Activate

Use this panel to activate or deactivate spirometry monitoring.
Monitoring can also be discontinued for whatever reason and resumed later.

➤ ***To activate and deactivate Spirometry monitoring:***

1. From the Spirometry menu select **Activate** - the Spirometry **Activate** panel is displayed.
2. Select the **Activate** checkbox to initiate Spirometry monitoring. Spirometry numeric parameters cannot be monitored together with Ventilator numeric parameters; if a Ventilator is active and you try to activate Spirometry, a warning message is displayed:

“Ventilator in use at [x:x]”, “To activate Spirometry, Deactivate Ventilator”

3. To activate Spirometry, deactivate the Ventilator
4. Press **Main Screen** to return to the main screen display

CAUTION! *The numeric parameters of the Spirometry module cannot be monitored together with the numeric parameters of the external Ventilator. If the* Menntor X7 *is connected via a* Menntor X7 *UIM module to an external ventilator, and the* Menntor X7 *displays the parameters of the Ventilator, then it is not possible for the* Menntor X7 *to display the numeric parameters from the Spirometry module at the same time.*

CAUTION! *If both the Ventilator interface and the Spirometry module are activated simultaneously, then the spirometry waveforms and*

loops are generated by the Spirometry module, while the numeric parameters come from the Ventilator.

Technical Alarm Messages

The following technical alarm messages may appear on the Menntor X7 display screen.

- Purge Pump On
- Tubing not connected

Note: *A list of the spirometry clinical alarm messages, appears in Chapter 7 of the Menntor X7 User Manual.*

Calibration

The Menntor X7 Spirometry module employs a pump and purge system to keep the tubing clear, allowing for continuous usage. No user calibration of the Spirometry module or airway sensor is required.

Labels: Spirometry Module

Symbol	Description	Location of Symbol
	Attention - Consult accompanying instructions for use	On the front panel of the module
	Type BF Applied part	On the front panel of the module
	Date of Manufacture	On the label attached to the back of the module
	CE approval by Notified Body	On the label attached to the back of the module

EZ-Flow™ Flow Airway Adapter Specifications

Flow Range:	2 - 180 lpm (33 - 3000 ml/s)
Accuracy:	± 5 % reading, or 0.5 lpm
Dead Space:	6.9 ml
Connections:	Airway - 15 mm ID/22 mmOD patient end by 15 mm ID ventilator end (ISO 5356-1)
	Monitor - Proprietary Smart connector
	Tri-Tubing - triple 0.055” inch ID lumen
Length:	2.5 inches (adapter) - 6 feet (tubing)
Weight:	6.3 grams (minus tubing)
Material:	Sensor - Polycarbonate (Makrolon)
	Tubing - Medical grade Polyvinyl Chloride

Trouble Shooting: Spirometry

Problem	Cause	Solution
Monitor measures flow when flow is zero	Fluid in measuring tubes	Activate Purge to clear the tubes. If this fails, replace the sensor
Negative volume measurement	Inverted sensor	See Figure 34-3 for the correct sensor direction
Negative volume measurement	Leakage in the ventilation circuit	Check ventilation circuit for leakage and correct.
Technical Alarm: Cable out	Sensor tubes not properly inserted	Reinsert sensor into sensor socket
Technical Alarm: Device Error	Device failure	Replace module – Contact Service
Technical Alarm: Calibration Error	Device failure	Replace module – Contact Service

SECTION 6
APPENDIXES

This section includes the following Appendixes:

Appendix A: Accessories

Appendix B: Trouble Shooting

Appendix C: Auto-Set Dynamic Alarm Limits

Appendix D: Setting Up the System

Appendix E: Setting Up the Interface Between Vigileo and Menntor X7

APPENDIX A: ACCESSORIES

The following cables, catheters, and electrodes are used to complete the interface between the patient and the ***Menntor X7***. They can be ordered from your nearest representative by specifying the part number

Table 1: ECG Accessories

Item and Description	***Part Number (P/N)***
551-306-5905 Lead ECG Kit, Adult Snap (I.P)	
*** USA Color Code**	
3 Lead ECG Kit, Adult Snap*	551-306-080
3 Lead ECG Kit, Grabber Clip	551-306-085
3 Lead ECG Cable only*	551-306-016
3 Lead ECG Cable, DIN for pre-wired electrodes (Neonatal)	551-306-116
Set of 3 Lead wires with Block, Snap*	551-306-024
Set of 3 Lead wires with Block, Mini Clip (Pediatric)	551-306-028
Set of 3 Lead wires with Block, Grabber Clip	551-306-132
5 Lead ECG Cable only*	551-306-017
Set of 5 Lead wires with Block, Snap*	551-306-025
Set of 5 Lead wires with Block, Mini Clip*	551-306-029
Set of 5 Lead wires with Block, Grabber Clip	551-306-133
5 Lead ECG Kit, Adult Snap*	551-306-090
5 Lead ECG Kit, Mini Clip	551-306-091
5 Lead ECG Kit, Grabber Clip	551-306-093
10 Lead ECG Kit, MiniClip	551-306-150
10 Lead ECG Kit, Grabber Clip	551-306-170
10 Lead ECG cable only	551-306-019

Table 1: ECG Accessories

Item and Description	*Part Number (P/N)*
Set of 10 Lead wires with block, Mini Clip*	551-306-031
Set of 10 Lead wires with block, Grabber Clip*	551-306-135
** European Color Code	
3 Lead ECG Kit, Adult Snap**	551-306-280
3 Lead ECG Kit, Mini Clip (Pediatric))**	551-306-281
3 Lead ECG Kit, Grabber Clip **	551-306-285
3 Lead ECG Cable only**	551-306-216
3 Lead Cable, DIN for pre-wired electrodes (Neonatal)	551-306-316
Set of 3 Lead wires with Block, Snap**	551-306-224
Set of 3 Lead wires with Block, Mini Clip (Neonatal)**	551-306-228
Set of 3 Lead wires with Block, Grabber Clip.**	551-306-332
5 Lead ECG Kit, Adult Snap*	551-306-290
5 Lead ECG Kit, Mini Clip	551-306-291
5 Lead ECG Kit, Grabber Clip	551-306-293
5 Lead ECG Cable only**	551-306-217
Set of 5 Lead wires with Block, Snap**	551-306-225
Set of 5 Lead wires with Block, Mini Clip**	551-306-229
Set of 5 Lead wires with Block, Grabber Clip	551-306-333
10 Lead ECG Kit, MiniClip	551-306-250
10 Lead ECG Kit, Grabber Clip	551-306-370
10 Lead ECG cable only	551-306-219
Set of 10 Lead wires with block, Mini Clip*	551-306-231
Set of 10 Lead wires with block, Grabber Clip*	551-306-335

Table 2: **BP Accessories**

Item and Description	***Part Number (P/N)***
BP Accessories	
BP Adapter Cable (Single)	551-306-011
BP Transducer Kit, Model MX860	800-060-580
Pressure Transducer MX860	800-060-582
Pressure Transducer Cable for MX860	800-060-584
Disposable dome for MX860 (5 domes/pak)	800-060-586
Mounting Clamp, vertical for MX860	800-060-588
Plate for mounting MX860	800-060-589
Disposable monitoring kit for MX860, 10 kits/pak	800-060-670
Disposable Transducer MX 950 (5/pack)	800-060-596
Pressure Transducer Cable for MX 950	800-060-595
TRANSPAC IV (Abbott Critical Care Systems)	
Art-Line (Biometrix),	

Table 3: Cardiac Output Accessories

Item and Description	***Part Number (P/N)***
Cardiac Output Accessories	
Close Injected C.O. Cable Kit	551-306-110
C.O. Adapter cable, CO-Set Type	551-306-013
Injected Temperature Probe, CO-Set Type	800-030-450
Iced Bath C.O. Cable Kit	551-306-120
C.O. Adapter Cable, Ice Bath Type	551-306-014
Injected Temperature Probe, Ice Bath Type	800-060-050

Table 4: Non-Invasive BP Accessories / Reusable NIBP Accessory Kits

Item and Description	*Part Number (P/N)*
Non-Invasive BP Accessories	
Reusable NIBP Accessory Kits:	
NIBP Accessory Kit, Adult	551-306-370
NIBP Accessory Kit, Pediatric	551-306-371
NIBP Accessory Kit, Infant	551-306-372
NIBP Accessory Kit, Adult/Pediatric	551-306-373
NIBP Accessory Kit, Adult	551-306-370
Reusable Cuff Adult/Pediatric	
Cuff Adult (25 - 35 cm)	800-271-322
Cuff Large Adult (33 - 47 cm)	800-271-329
Cuff Thigh (46 - 66 cm)	800-271-327
Cuff Pediatric (18 - 25 cm)	800-271-328
Cuff New Born/Infant (6 - 11 cm)	800-271-324
Cuff Adult (25 - 35 cm)	800-271-322
Reusable NIBP Accessory kits Adult/Pediatric (CAS)	
NIBP Accessory Kit, Adult	551-306-272
NIBP Accessory Kit, Pediatric	551-306-271
NIBP Accessory Kit, Infant	551-306-270
NIBP Accessory Kit, Adult/Pediatric	551-306-273
NIBP Accessory Kit, Adult	551-306-272
NIBP Accessory Kit, Pediatric	551-306-271
Reusable Cuff Adult/Pediatric	
Cuff, Adult (23 - 33 cm)	800-261-322
Cuff, Large Adult (31 - 40 cm)	800-261-329
Cuff, Thigh (38 - 50 cm)	800-261-321
Cuff, Small Adult (17 - 25 cm)	800-261-328
Cuff, Child (12 - 19 cm)	800-261-323
Cuff, Infant (8 - 13 cm)	800-261-324

Table 5: Temperature Accessories

Item and Description	Part Number (P/N)
Dual Temperature Adapter Cable	551-306-023
Temperature Probe, General Purpose, Adult	800-060-010
Temperature Probe, General Purpose, Pediatric	800-060-020
Temperature Probe, Surface	800-060-030

Table 6: Reusable Cuff Adult/Pediatric

Item and Description	Part Number (P/N)
Cuff, Adult (23 - 33 cm)	800-261-322
Cuff, Large Adult (31 - 40 cm)	800-261-329
Cuff, Thigh (38 - 50 cm)	800-261-321
Cuff, Small Adult (17 - 25 cm)	800-261-328
Cuff, Child (12 - 19 cm)	800-261-323
Cuff, Infant (8 - 13 cm)	800-261-324

Table 7: Reusable NIBP Accessory kits Adult/Pediatric (CAS)

Item and Description	Part Number (P/N)
NIBP Accessory Kit, Adult	551-306-272
NIBP Accessory Kit, Pediatric	551-306-271
NIBP Accessory Kit, Infant	551-306-270
NIBP Accessory Kit, Adult/Pediatric	551-306-273
NIBP Accessory Kit, Adult	551-306-272
NIBP Accessory Kit, Pediatric	551-306-271

Table 8: Neonatal NIBP Accessories

Item and Description	Part Number (P/N)
NIBP Accessory Kit, Neonatal (Disposable Cuffs)	551-306-274
Disposable Cuffs (Box of 10)	
Disposable Cuffs, Neonatal # 1 (3 - 6 cm)	800-260-332
Disposable Cuffs, Neonatal # 2 (3 - 8 cm)	800-260-333
Disposable Cuffs, Neonatal # 3 (6 - 11 cm)	800-260-334
Disposable Cuffs, Neonatal # 4 (7 - 14 cm)	800-260-335
Disposable Cuffs, Neonatal # 5 (8 - 15 cm)	800-260-336
Air Hose (Without LUER Connection)	
Single Lumen Adult/Pediatric Inflation tube	800-260-326
Single Lumen Neonatal Inflation tube	800-260-337

Table 9: Pulse Oximetry (SpO2) Accessories (Nellcor)

Item and Description	Part Number (P/N)
SpO2 Adapter Cable	551-306-015
SpO2 Finger Sensor	800-306-730
Nellcor Multi-Site Dura-Y Sensor, D-YS	800-060-930
Nellcor Ear Clip for Dura-Y Sensor, D-YSE	800-060-940
Nellcor Disposable Oxisensor, Pediatric Index Finger, D-20 (24 per case)	800-060-970
Nellcor Disposable Oxisensor, Neonatal Foot N-25 (24/Case)	800-060-950
Nellcor Disposable Oxisensor, Infant Great Toet I-20 (24/Case)	800-060-960
SpO2 OxiMax Adapter Cable	551-306-415
SpO2 Adapter Cable	551-306-115
SpO2 OxiMax Reusable, Adult Finger Sensor	800-060-731
Multi-Site OxiMax Dura-Y Sensor, D-YS.	800-060-931
Ear Clip for OxiMax Dura-Y Sensor, D-YSE	800-060-941
Disposable OxiMax, Neonatal Foot N-25 (24/Case)	800-060-951
Disposable OxiMax, Infant Great Toe I-20 (24/Case)	800-060-961
Disposable OxiMax, Pediatric Index Finger D-20 (24/C)	800-060-971

Table 10: Pulse Oximetry (SpO2) Accessories (Masimo)

Item and Description	Part Number (P/N)
Pulse Oximetry (SpO2) Accessories (Masimo)	
SpO2 Adapter Cable	551-339-000
SpO2 reusable adult Finger Sensor	551-339-004
Adult disposable probe	551-339-001
Neonatal disposable probe	551-339-002
Neonatal disposable probe for sensitive skin	551-339-003
Foam rap for neonatal pt sensor (12/pkg)	551-339-053
Tapes for neonatal adhesive sensor (100/pkg)	551-339-054

Table 11: Pulse Oximetry Accessories (Masimo-LNCS),

Item and Description	Part Number (P/N)
Pulse Oximetry Accessories (Masimo-LNCS),	
SpO2 (LNCS) Adapter Cable 8ft	551-306-321
SpO2 Reusable, Adult Finger Sensor with short Cable (LNCSDCI)	551-339-205
SpO2 Reusable, Multisite Sensor (Masimo LNCS YI)	551-339-207
SpO2 Reusable, Ear Sensor (LNCS TC-I)	551-339-208
SpO2 Disposable, Adult Finger Sensor (Masimo LNCS Adt, 20/box)	551-339-221
SpO2 Reusable, Pediatric Sensor (Masimo LNCS DC-IP)	551-339-206
SpO2 Disposable, Pediatric Sensor (Masimo LNCS Pdt, 20/box)	551-339-222
SpO2 Disposable, Infant Sensor (Masimo LNCS Inf, 20/box)	551-339-223
SpO2 Disposable, Neonatal Sensor (Masimo LNCS Neo, 20/box)	551-339-224
SpO2 Disposable, Neonatal Sensor (Masimo LNCS NeoPt)	551-339-225

Table 12: Pulse Oximetry Accessories (Masimo-LNOP)

Item and Description	Part Number (P/N)
Pulse Oximetry Accessories (Masimo-LNOP),	
SpO2 (LNOP) Adapter Cable 8ft	551-306-021
SpO2 (LNOP) Adapter Cable 12ft	551-306-121
SpO2 (LNOP) Adapter Cable 12ft	551-306-121
SpO2 Reusable, Adult Finger Sensor with short Cable (LNOP DCI)	551-339-015
SpO2 Reusable, Pediatric Finger Sensor with short Cable (LNOP DCIP)	551-339-006
SpO2 Reusable, Ear Sensor (LNOP)	551-339-735
SpO2 Reusable, Multisite Sensor (LNOP)	551-339-931
SpO2 Disposable, Adult (LNOP) Finger Sensor (20/Box)	551-339-001
SpO2 Disposable, Pediatric/Slender (LNOP) Digit Probe (20/Box)	551-339-025
SpO2 Disposable, Neonatal Probe (20/Box)	551-339-002
Disposable NeoPT, Neonatal Probe for sensitive skin (20/Box)	551-339-003
Foam wrap for NeoPT Sensor (12/PKG)	551-339-053
Tapes for Neonatal Adhesive Sensor (100/PKG)	551-339-054

Table 13: EtCO2 Microstream Accessories

Item and Description	Part Number (P/N)
Filter Line H Set Adult/Pediatric (25/Pak)	800-060-141
Filter Line H Set Infant/Neonatal (25/Pak	800-060-142
CAPNO Nasal Line H Adult (25/Pak)	800-060-143
CAPNO Nasal Line H Pediatric (25/Pak)	800-060-144
CAPNO Nasal Line H Infant/Neonatal (25/Pak)	800-060-145
CAPNO Nasal Line H/O2 Adult (25/Pak)	800-060-146
CAPNO Nasal Line H/O2 Pediatric (25/Pak)	800-060-147

APPENDIX B: TROUBLE SHOOTING

If you have any problems, or the setup procedure does not function as described, check the appropriate table, as follows:

ECG/Respiration Monitoring

Table B-1: ECG/Respiration Monitoring

Problem	*Probable Cause*	*Corrective Action*
No display	1. The system is not plugged in and switched on. 2. The ECG/Resp cable is not inserted correctly. 3. The Display is broken.	1. Check that the system is plugged in and switched on. 2.Check that the ECG cable is correctly inserted. 3. Call Mennen Medical Service.
ECG Cable Out message instead of HR/Resp numerics.	1. The ECG cable is not connected.	1. Check that the ECG cable is connected.
Lead fault or All lead fault	1. One or more electrodes are detached. 2. No electrolyte gel on the electrodes. 3. Strong solvent used for cleaning skin. 4. A 3 Lead set is used and channels 2 and 3 are not switched off.	1. Check that the electrodes are correctly attached. 2. Check that there is sufficient gel on the electrodes. 3. Change solvents used for cleaning skin in line with your Hospital Procedure Policy. 4. Ensure that channels 2 and 3 are switched off or change to 5-lead set.
ECG waveform is present but the Resp channel shows a flat line.	1. One of the Resp electrodes is loose 2. No electrolyte gel on the electrodes.	1. Check that the Resp electrodes are properly attached. 2. Check that there is sufficient gel on the electrodes.
Straight line on one or more ECG waveforms	Lead fault	Reconnect the faulty lead

Response to Single Lead Fault

Table B-2: Responst to Single Lead Fault

Lead Fault	Active leads	Straight lines
LA	II, aVR, aVL, aVF	I, III, all V
RA	III, aVR, aVL, aVF	I, II, all V
LL	I, aVR, aVL, aVF	II, III, all V
RL	I, II, III, aVR, aVL, aVFm V2 to V6	V1
V1	I, II, III, aVR, aVL, aVFm V2 to V6	V1
Vb (b = 2 to 6)	I, II, III, aVR, aVL, aVFm V1 to V6 (without Vb)	Vb

Invasive Blood Pressure Monitoring

Table B-3: Invasive Blood Pressure Monitoring

Problem	Probable Cause	Corrective Action
Abnormally low pressure	Transducer level higher than heart. Loose connections.	Check patient and transducer positions. Check and tighten connections.
No Pressure	If the monitor is switched on and there is no pressure, a transducer or connector wire may be broken.	1. Replace transducer and cable. 2. Check stopcocks.
Noise or fling in the pressure waveform	1. Movement of PAP catheter tip. 2. Motion of pressure tubing.	1. Reposition catheter (according to hospital procedures policy). 2. Make sure the patient or ventilator tubing is not touching the pressure tubing.
Dampened arterial waveform	1. Thrombus formation or blood left in catheter following blood sampling. 2. Large air bubble in tubing. 3. Catheter tip against the vessel wall. 4. Catheter kinking or arteriospasm. 5. Tubing too long or pliant. 6. Improper sequence of stopcock operation. 7.Defective transducer and or amplifier.	Use syringe to withdraw air or particles in catheter, then flush the line with fresh solution. Use syringe to withdraw air in tubing, then flush line with fresh solution. Reposition the catheter to relieve spasm. Shorten the tubing (recommended length 3-4ft.) or replace with large diameter stiff tubing. Flush line, re-zero and recalibrate. Replace transducer and have the monitor checked.

Table B-3: Invasive Blood Pressure Monitoring

Problem	Probable Cause	Corrective Action
Resonating arterial waveform	1. Small air bubbles to the in, or very close transducer. 2. Tubing too long.	1. Carefully flush the transducer and tubing when setting up system. De-bubble carefully after each flush. 2. Shorten tubing.

EtCO2

Table B-4: EtCO2

Problem	*Probable Cause*	*Corrective Action*
Airway Adapter occluded (intubated patient)	Dirty/foggy adapter Incorrect adapter/sensor connection Sensor on top of circuit	1. Check adapter for cleanliness and fog. An airway adapter may fog when placed in a warm circuit. Wait a few minutes for the fogging to disappear. 2. Check that the adapter/sensor are correctly connected.
Sidestream occlusion	Kinks in line . Watertrap obstructed	Check for kinks in the sampling line. If no kinks are evident, disconnect the sampling line from the water-trap. If message clears, replace the sampling line. If message remains, replace the watertrap. If message persists, contact your service representative.
Error message	Device fault detected	If Mainstream is being activated, check that the sensor in use is the correct sensor recommended for use with the unit. Repeat start-up procedure. If the error message persists, contact your service representative.
Exhaust occluded	Kinked exhaust line, kinked internal pneumatics, bad pump	Disconnect the exhaust port con-nection. If message persists, contact your service representative.

APPENDIX C:
AUTO-SET DYNAMIC ALARM LIMITS

The table below shows the formulas that are used to calculate the alarm limits in the Auto-set mode

Table C-1: Envoy™/Menntor X7 Dynamic Alarm Limit

Parameter	Unit	LOW	HIGH
HRT/ SPO2 Pulse/ ART Pulse	BPM	HRT*0.8 + 5	HRT*0.9 + 34
ST	mm =0.1mV	Value - 1	Value + 1
CVP/ICP/PAP/ RAP/LAP	mmHg		
BP <= 25		BP - 5	BP + 5
BP > 25		BP*0.8	BP*1.2
NIBP	mmHg		
SYS		SYS*0.68 + 11	SYS * 0.86 + 38
DIAS		DIAS*0.68 + 6	DIAS*0.86 + 32
MEAN		MEAN*0.68 + 8	MEAN*0.86 + 35
ART(SYS, DIAS, MEAN)/ BP	mmHg		
BP <= 25		BP - 5	0.86*BP + 32
25 < BP <= 200		0.68*BP + 6	0.86*BP + 32

Table C-1: Envoy™/Menntor X7 Dynamic Alarm Limit

BP > 200		0.68*BP + 6	BP + 8
TMP /DELTA TMP	CEL	TMP - 0.5	TMP + 0.5
RSP/EtCO2-RSP		RSP/2 but not less than 4	RSP*2 but not more than 150
SPO2			
VALUE >= 85	%	Value - 5	100
VALUE < 85	%	80	90
CO	Lt/min	Value - 2	Value + 2
ETCO2	mmHg	ETCO2*0.8	ETCO2*1.2
INCO2	mmHg	----	INCO2 + 4

APPENDIX D:
SETTING UP THE SYSTEM

Note: *Access to System Setup is password protected.*

Appendix D includes instructions for configuring the following ***Menntor X7*** parameters:

- Store Diagnostic File
- Date & Time Setup
- General Settings
- Alarm Volume & Controls
- Disable Touch Screen (in Touch screen option)
- Sound Event
- Default Alarm Limits
- Event Setup
- NIBP Leakage test
- Vital Sign (VS) Setup
- Parameter Hierarchy
- Monitor Profiles
- Admit by Default
- Report Setup
- Automatic Reports
- Network Setup
- Recorder Setup
- Trends Setup
- QuicKeys™
- Tabular Charts

- Software Version
- Change Password
- Check Disk
- Permission Editor
- Remove Saved Patients
- Touch Screen Calibration
- Demo Mode
- Build Master Configuration
- Copy Configuration From

Introduction

System Setup enables configuration of global controls, such as setting the date and time or defining the default language for the Menntor X7. It is also used to define default values for all monitored vital signs. The Menntor X7 is configured at the factory with factory default values which can be changed as needed by your hospital or department. Access to the System Setup menu is limited to authorized personnel such as a System Administrator or Hospital Biomedical Engineer possessing a pre-defined password.

Accessing the System Setup Menu

From the **System Setup** menu, you can access the following dialog panels:

- **Store Diagnostic File**

Use this panel to store a diagnostic file in the event of a malfunction or failure of the Menntor X7. See Service Manual for instructions on how to download the diagnostic files and send them to the Service dept. of Mennen Medical.

- **Date & Time Setup**

Use this panel to set the date and time and to set time display formats for the Menntor X7 bedside monitor. See “Date & Time Setup” on page D-8.

- **General Settings**

Use this dialog panel to define general information, such as the hospital name and parameters controlling general panel behavior. See “General Settings” on page D-11.

- **Disable/Enable Touch Screen**

Monitors and Ensemble equipped with Touch Screen have a toggle to disable the touch screen feature for cleaning

- **Alarm Volume & Controls**

Use this panel to define general alarm-related parameters, such as alarm volume, color scheme, etc. See “Alarm Volume and Controls” on page D-14.

- **Sound Event**

Use this panel to assign audio messages to various events. See “Sound Event” on page D-17.

- **Default Alarm Limits**

Use this panel to set new default alarm limits for all monitored vital signs. See “Default Alarm Limits” on page D-18.

- **Event Strip**

Use this panel to prepare or modify a list of Event Strip Labels, and to define the response of the Menntor X7 to the activation of the Mark Event key.

- **Leakage Test**

Use this panel to perform Leakage test of the NIBP module and cuff. The test is password protected (after Event Strip)

- **Vital Sign (VS) Setup**

Use this panel to set default parameters and units for each vital sign available for monitoring in the Menntor X7 bedside monitor. These include alarm parameters and other parameters specific to the monitored vital sign. See “Vital Sign (VS) Setup” on page D-22.

- **Parameter Hierarchy**

Use this panel to present the Hierarchy of VS parameters. See “Parameter Hierarchy” on page D-52.

- **Monitor Profiles**

Use this panel to preset and label monitoring profiles. See “Monitor Profiles Setup” on page D-54.

- **Admit By Default**

Use this option to return the Menntor X7 to default parameters. See “Admit by Default” on page D-57.

- **Report Setup**

Use this dialog panel to define and edit report formats. See “Report Setup” on page D-58.

- **Automatic Reports**

Use this panel to set the time and type of automatic report printout on the network printer. See “Automatic Reports” on page D-62.

- **Network Setup**

Use this panel to configure devices, such as monitors, printers, etc. on the network. See “Network Setup” on page D-64.

- **Recorder Setup**

Use to define default recording options. See “Recorder Setup” on page D-65.

- **Trends Setup**

Use to set the scales of the graphic trend for each vital sign. See “Trends Setup” on page D-67.

- **QuicKeys™**

Use this panel to prepare “QuicKeys™” for single button access to monitoring functions. See “QuicKeys™ Setup” on page D-68.

- **Tabular Charts**

Use this panel to create User Defined Charts, customized to the specific needs of a unit or patient. See “Tabular Charts” on page D-69.

- **Software Version**

The Software Version panel displays the software version of all inputs and manages loading of new software to the vital signs inputs. See “Updating the Software Version” on page D-72

- **Change Password**

Use this panel to define a new password for entering the System Setup menu. See “Change Password” on page D-75.

- **Check Disk**

Check disk is a technical procedure resets all parameters to factory default settings.. This panel is for use by *authorized service personnel only.* See “Check Disk” on page D-76.

- **Permission Editor**

Use this panel to define which Menntor X7 menu options are available. See “Permission Editor” on page D-77.

- **Remove Saved Patients**

Use this panel to access a list of all the patient data saved by the Menntor X7 and to remove some or all of the saved files. See **“Remove Saved Patients” on page D-78.**

- **Touch Screen Calibration**

Note: *Monitors and Ensemble equipped with Touch Screen have a key to start Touch screen calibration* *See "Touch Screen Calibration" on page D-78.*
*In the **System Setup** menu, some of the dialog panels can be accessed only when the Menntor X7 is **not** currently monitoring a patient. In this case, if a patient is being monitored, he/she must first be discharged, meaning that monitoring of that patient must be stopped.*
*On the other hand, some of the dialog panels can be accessed only when a patient **is** currently being monitored.*

- **Demo Mode**

See "Demo Activation" on page D-78.

- **Build Master Configuration**

Use this key to store a configuration for future copying to different Envoy monitors.

- **Copy Configuration From**

Use this key to copy a configuration from a master configuration monitor.

Note: *See Table D-1 below for the access capabilities in the dialog panel:*

Table D-1: Table D-1: Access Capabilities in the Dialog Panel

	Patient Discharged	Patient Monitored
Store Diagnostic File	++	++
Date & Time Setup	++	__
General Settings	++	__
Enable Touch Screen	++	++
Alarm Volume & Controls	++	++
Sound Event	++	++
Default Alarm Limits	++	__
Event Setup	++	++
Leakage Test	---	++
CO2 Calibration	__	++
Vital Sign (VS) Setup	++	__
Parameter Hierarchy	__	++
Monitor Profiles	__	++
Admit By Default	++	__

Table D-1: Table D-1: Access Capabilities in the Dialog Panel

Report Setup	++	++
Automatic Reports	++	++
Network Setup	++	++
Recorder Setup	++	++
Trends Setup	++	++
QuicKeys™	__	++
Tabular Charts	++	++
Software Version	++	__
Change Password	++	++
Check Disk	++	__
Permission Editor	++	++
Remove Saved Patients	++	++
Touch Screen Calibration	++	++
Demo Mode	++	-
Build Master Configuration	++	__
Copy Configuration From	++	__

➤ ***To discharge a patient:***

1. Press the **Setup** key to access the **ADT** menu and select **Discharge Patient**.
2. A window appears informing you that all patient data will be erased and asking you to confirm patient discharge.
3. Press **Discharge** to stop patient monitoring and erase patient data. The Menntor X7 bedside monitor is now ready to admit a new patient

   –or–

   Press **Cancel** to cancel the discharge, close the panel and return to the main screen display.

   Once the patient has been discharged, all defined **Monitor Profile** Admit Keys appear on the now blank display screen. You are now ready to access the **System Setup** menu.

➤ ***To access the System Setup menu:***

1. Press **Setup** button, the **Setup** menu is displayed.
2. Turn the QuicKnob™ until the **System Setup** button is highlighted and press. The **System Password** panel appears requesting the password.

Figure D-1: The System Password Dialog Box

3. Enter the correct password. The **System Setup** menu is displayed.

Date & Time Setup

This panel enables you to set the date and time and to set time display formats for the Menntor X7 bedside monitor.

Time Server

The Date and Time setting of the Menntor X7 monitor can be set on each monitor individually, or, if the monitors are connected to a LAN, by one device defined as the Time Server.

Only ONE device on the network can function as the Time Server. If one of the devices is set to become the Time Server, then the Date and Time setting on all other devices will be disabled and the time can be changed only on the Server device.

The Time Server sends a time signal every 30 seconds to all the devices on the network.

Monitors that are in the Discharge mode, reset their time to the time sent by the server. Monitors that are in the process of monitoring a patient, will not respond to the Time Server.

The Enguard always responds to the Time Server and resets its own time, but this will not affect the device that the Enguard is viewing.

The Ensemble always responds to the Time Server and will reset **its own time, but this will not affect the device/s it is viewing.**

➤ ***To create a Time Server:***

1. Select System setup (password protected) in the Setup menu.
2. Select Date & Time Setup **in the System setup menu**.
3. **In the Time Server Master, set the "Time server Master" to ON (Green**).
4. **Use the** Current Date & Time **box to change the time and/or date.**

*Note: If there is a **Time Server Master** on the network, then:*

All other devices will show the Device ID and the Device name of the Time Server Master on the "Date & Time" panel.

The "Current Date & Time" box will show the date & time, but will be dimmed and not accessible.

The **Date and Time Setup Panel** is divided into 3 major areas (**note -** the function **Daylight Saving Date** is not active):

- **Current Date and Time**

  As the name implies, the current date and time are set in this area.

- **Shift End Time**

  Specify the end times for each work shift according to what is standard in your department or hospital. The end time defined for the shift also indicates the start time of the following shift. For example, if the Day shift ends at 15:00, this indicates that the Evening Shift begins at 15:00. The **Date and Time Setup** panel provides space for three shifts: **Day**, **Evening** and **Night**.

- **Display Format**

  In the **Display Format** area, you define how the time and the date appear on the main screen display.

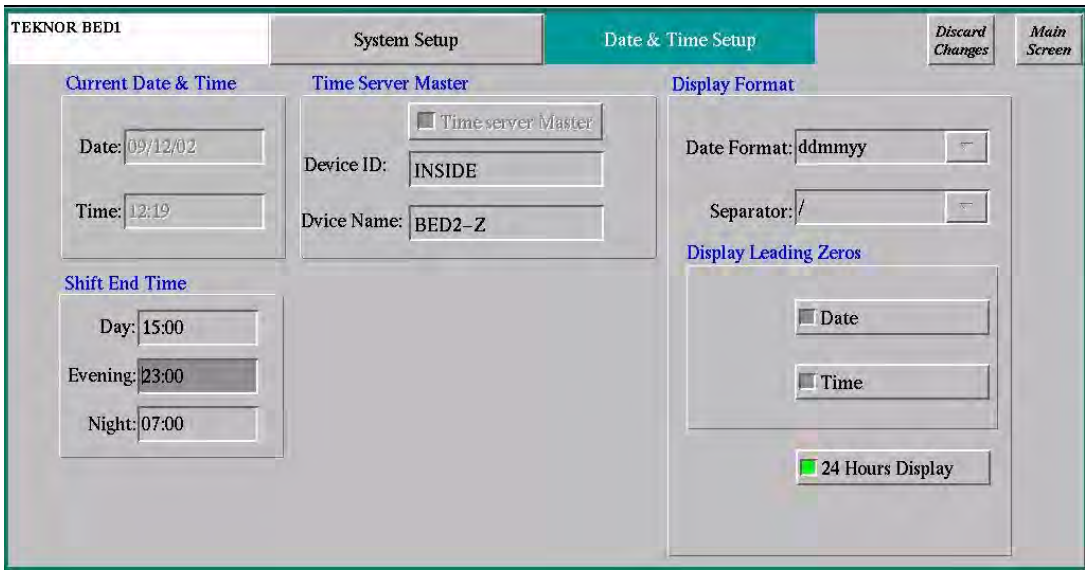


Figure D-2: The Date & Time Setup Panel

➤ ***To set the date and time display formats:***

1. Select the **Date** textbox. A calendar panel is displayed.
2. Using the QuicKnob™, select the day, month and year.
   - Turn the QuicKnob™ until the monthly calendar is highlighted and press. Now the calendar is selected.
   - Begin turning the QuicKnob™ again to move through the days of the month. When the correct day is highlighted, press the QuicKnob™.
   - Turn the QuicKnob™ until one of the arrows on the month indicator is

highlighted. The arrow on the right, when selected, advances the months, the arrow on the left goes back. Press to select the correct month.

- Turn the QuicKnob™ until the year is highlighted and press to select. Turn the QuicKnob™ clockwise to advance in 10-year steps. Press and turn the QuicKnob™ to advance in one-year steps. Turn the QuicKnob™ counter-clockwise in the same manner to go back.

3. Select **Cancel Changes** to close the panel without applying the changes
–or–
Select **Accept** to apply the changes and return to the **Date and Time Setup** panel.
4. Select the **Time** area. An Hour/Minute panel is displayed.
   - Select **Hours**/**Minutes** and turn the QuicKnob™ to set the time. Turning the QuicKnob™ clockwise goes forward in time. Turning the QuicKnob™ counter-clockwise goes back.
   - Once you have set the minutes/hours, you must press the QuicKnob™ again to go on to the next parameter.
5. Under **Shift End Time**, select **Day**, **Evening**, or **Night**. The **Hour**/**Minute** panel is displayed. Enter the shift end time in the same way you set the time for the **Time** area.
6. Under **Display Format**:
   - Select **Date Format**. A drop-down list is displayed. There are three available options: **ddmmmmyy**, **ddmmyyyy**, or **mmddyy**. The factory default is **mmddyy**.
   - Select **Separator**. The **Keyboard** panel is displayed. Select a character to be used by the system as a separator between elements of a date (such as "." or "/"). Only a single character can be selected.
7. Under **Display Leading Zeros**, select the **Date** or **Time** checkbox to activate display of a leading zero (for example, 01/01/98, or 01:30). Clear the checkbox to deactivate.
   - Select the **24 Hour Display** checkbox to activate display of time in a 24-hour format (00:00 - 24:00). Clear the checkbox to have time displayed in a 12-hour format (12A.M. AND 12 P.M.)
   - When the **24 Hours Display** checkbox is cleared, the **Suffix** (am/pm) checkbox is enabled. Select to display the suffix AM or PM after the time when time is displayed in 12-hour format. Clear the checkbox to remove the suffix.

8. Select **Discard Changes** to close the panel without applying any changes,
–or–
Select **Main Screen** to apply the changes and close the panel.

General Settings

Use this dialog panel to set parameters that:

- affect general panel behavior (timeouts, etc.)
- define general information, such as the name of the hospital,
- set the interface language for the panels, default measurement units, etc.
- set the Remote View panel, between full panel and 1/3 panel
- deactivate the fan

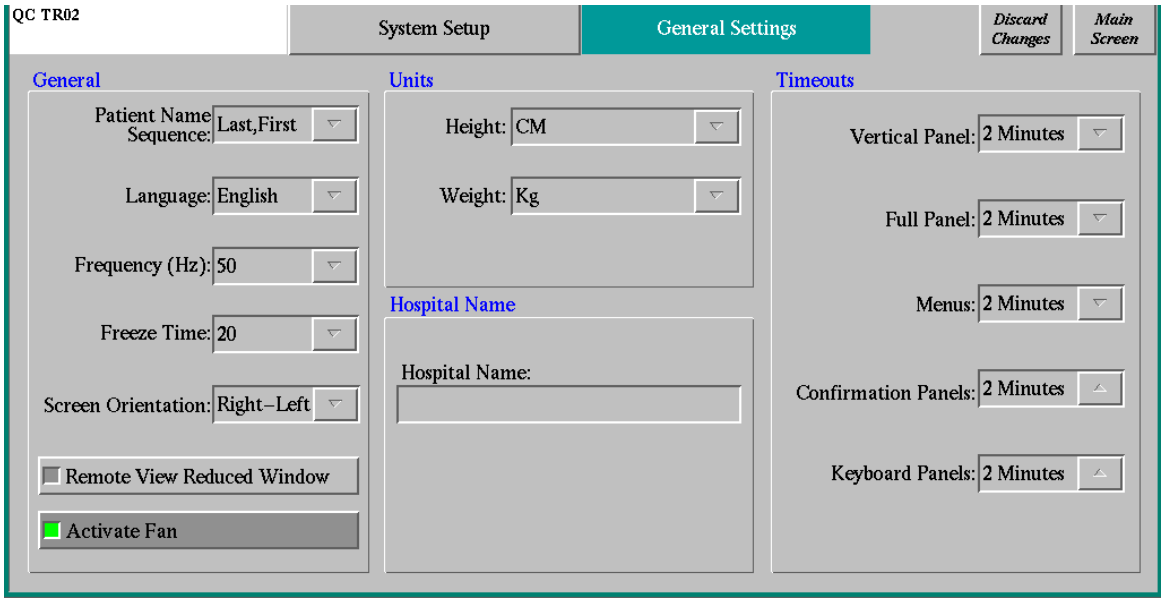


Figure D-3: The General Settings Dialog Panel

The General Settings panel is divided into five areas; General, Units, Timeouts, Hospital Name and and Special Features

General

Under the General area, you can configure the following parameters:

Patient Name Sequence

It is possible to choose between [Last, First] (default) or [First, Last].

Language

Defines the language used for display purposes and as the interface language on the dialog panels. You can choose from a provided list of languages - currently, English and French are supported. The factory default language is English.

CAUTION! *After changing the Language you need to restart the monitor.*

Frequency

Defines the monitor frequency in Hertz (Hz). You can select either 50 or 60Hz.

Freeze Time

By pressing the Freeze button on the front panel, a user can stop updating of all waveform information displayed on the main screen for a period of time which is defined here. The available freeze times are 10, 20, or 30 seconds.

Screen Orientation

Defines the location in which numerical values and waveforms are displayed on the main screen. There are two options available; Right-Left or Left-Right.

Remote View Reduced Window

Activating this toggle causes Remote View to cover a 1/3 of the display.

Units

Under the Units area, you can define the default measurement units used for patient's height and weight.

Height

The units of measurement available are; CM (centimeters), or IN (inches). The factory default is CM.

Weight

Available units of measurement are; Kilograms (Kg), Grams (Gr), Pounds (Lb), or Pounds and Ounces (Lb & Oz.). The factory default is Kg.

Timeouts

Under the Timeouts area, you can define the period of time which elapses from the last time an action was performed in a panel or menu to the time it is automatically closed by the system and disappears from the main screen display. The timeout can be defined for each type of panel and for menus. The following panels can be configured for timeout; Vertical Panels, Horizontal Panels, Full Panels,

Confirmation Panels, Keyboard Panels and Menus. The available timeout options for all types of panels are; None (panel or menu will not automatically close) 1 min., 2 min., 4 min., or 10 min. The factory default timeout for all panel types is 2 min.

Hospital Name

Under Hospital Name, you can enter the name of the hospital. This name will then appear in the Header area on the main screen display.

Setting the General Settings Panel

The General Settings panel can be accessed from the System Setup menu, or, if you are currently in another System Setup panel, from the drop-down menu list to the right of the back menu button (“System Setup”) on the top of the screen.

➤ ***To define General Settings:***

1. Under **General**, select the required **Language**, **Frequency**, **Freeze Time**, and **Screen Orientation**.
2. Under **Charts**, select the **Default Frequency**.
3. Under **Units**, select the required default measurement units for the patient’s height and weight.
4. Under **Timeouts**, select the required timeouts for the various panels and menus.
5. Under **Hospital Name**, select the **Hospital Name** text box. The alphanumeric keyboard appears. Using the QuicKnob™, enter the name of the hospital and close the keyboard.
6. Select **Discard Changes** to close the panel without applying any changes
   –or–
   select **Main Screen** to apply your changes and return to the blank screen.

CAUTION! *After changing the Language you need to restart the monitor.*

Alarm Volume and Controls

Use this panel to define general alarm-related parameters, such as alarm volume, color scheme, etc. These parameters are defined for each alarm priority level, enabling the alarm response for each alarm priority to be unique. For a more detailed description of Alarms, including alarm priority and notification, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operating Manual*.

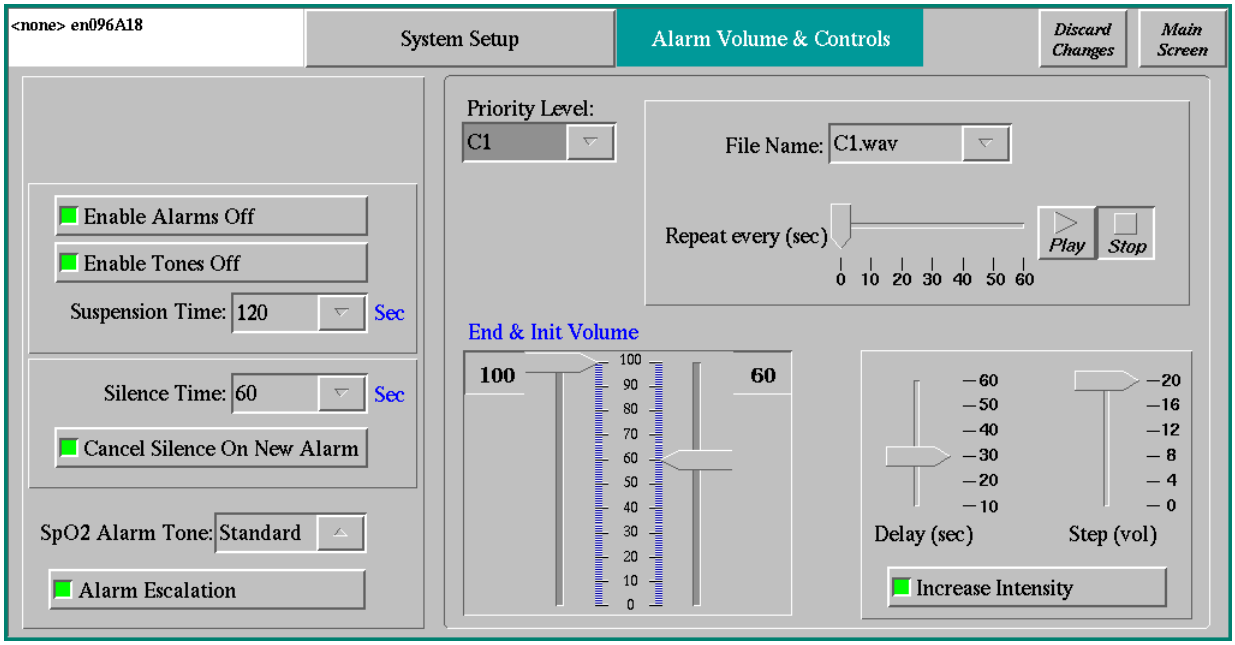


Figure D-4: The Alarm Volume & and Controls Panel

The panel is divided into two major areas. Parameters common to all alarms are located on the left of the panel. These parameters include; **Alarm Color Scheme**, **Suspension Time**, **Silence Time**, and **SpO2 Alarm Tone**. On the right side of the panel, parameters specific to each alarm priority are set. These fields include; **File Name**, **Repeat Every (sec)**, **End and Init Volume**, **Delay**, **Step** and **Increase Intensity**. These parameters remain disabled until an alarm priority is selected. A description of each **Alarm Volume and Control** panel field follows.

Enable Alarm Off

Depending on the regulation of each country or institution, the option to be able to turn off alarms can be allowed by activating “**Enable Alarm Off**” or can be prevented by not activating “**Enable Alarm Off**”.

When the **Alarms Off** key on the Menntor X7 front panel is pressed, all detection of clinical alarms is disabled for a pre-defined period. Technical alarms are still detected and visually displayed in the appropriate area on the main screen.

Under **Suspension Time**, you can select the period of time that **Alarms Off** is in effect when the **Alarms Off** button is pressed. The available options are; **30**, **60**, **90**, and **120** seconds. **Alarms Off** can be configured to be permanent (where allowed by law). When the **Enable Alarms Off** checkbox is selected, the option "**Permanent**" is added to the available options under **Suspension Time**. The factory default suspension time is 60 seconds.

Silence Time

When pressed, the **Silence** key terminates any audio alarms active at that moment for a predefined period which you can set under **Silence Time**. The available options are; **30**, **60**, **90**, and **120** seconds. The factory default is **30** seconds.

SpO2 Alarm Tone

Defines whether SpO2 alarms are indicated with the same standard tone as other alarms of the same priority or whether they are indicated with a tone unique to SpO2. The available options are **Standard**, or **Unique**.

Priority Level

Defines the alarm priority level for which you wish to define alarm volume parameters. The available priority levels are; **C1, C2, C3, C4, Low HR, High HR, T1, T2**, and **SpO2**. When you select an alarm priority level, the following fields are enabled:

File Name

Defines the .WAV file (sound file) which supplies the alarm tone for the selected alarm priority. The available options are; **C1.WAV, C2.WAV, C3.WAV, T1.WAV, T2.WAV** and **SpO2.WAV**. Each file corresponds to the default alarm priority of that name. Additional *.WAV are available for user selection.

CAUTION! *If you select for C1, C2, C3, C4 a different *.wav file than the default, it is recommended to use the Inter-burst Interval per the following standard requirement:*

Table D-2: Priority Standard

Priority	*Inter-burst Interval*
C1	**0 to 5 sec**
C2	**2.5 sec to 30 sec**
C3	**2.5 sec to 30 sec**
C4	**> or = C3**

Repeat Every (sec)

Defines the time period after which an alarm is repeated (every 10 seconds, every 20 seconds, etc.). The available options are; **10, 20, 30, 40, 50**, and **60** seconds. You can press the **Play** button to sample the selected alarm tone. The factory default values are as follows:

- C1, C2, C3 and C4 - 20 seconds
- T1 - 30 seconds
- T2 - 60 seconds
- SpO2 - 5 seconds

Note: ***Note****:A repeat time of 0 seconds indicates that the alarm tone is continuous.*

End and Init Volume

Sets the volume of the alarm tone when the alarm is first triggered (Initial Volume) and the maximum volume the alarm can reach until responded to (End Volume). The alarm volume gets progressively louder until it reaches the maximum level, then remains at that maximum level until someone responds. **End and Init Volume** is set on a scale of 0-100. Sliders are provided to set the volume. The left slider controls the end (maximum) volume and the right slider controls the init (initial) volume.

Delay (sec)

Sets the time delay (in seconds) until the alarm increases in volume. **Delay** is set on a scale of 10-60.

Step (vol)

Sets the increase in alarm volume after each delay. **Step** is set on a scale of 0-20 (in units of 4).

Increase Intensity

Select this checkbox to enable increase in alarm volume. If this option is disabled, the alarm tone remains at its initial level of volume.

Setting the Alarm Volume & Control Panel

You can access the **Alarm Volume & Control** panel from the **System Setup** menu.

➤ ***To set Alarm Volume and Controls:***

1. Select the required **Alarm Color Scheme**.

2. Select or clear the **Enable Alarm Off** checkbox, as required.
3. From the drop-down menu, select the required **Suspension Time** for the alarm.
4. From the **Silence Time** drop-down menu, select the alarm silence time.
5. From the **SpO2 Alarm Tone** drop-down menu, select the type of alarm tone for SpO2 alarms.
6. From the **Priority Level** drop-down menu, select the alarm priority level to be configured.
7. Print the Message you would like to receive in the event of an external device alarm and press accept.
8. From the **File Name** drop-down menu, select the alarm tone .WAV file for the selected priority level.
9. Set the **Repeat Every (sec)** scale by moving the slider to the required time period. Select **Play** to hear a sample of the alarm tone. Select **Stop** to end the playback of the alarm tone.
10. Under **End and Init Volume**, set the left slider to the maximum alarm volume and the right slider to the initial alarm volume.
11. Set the **Delay** slider to the required delay (in seconds).
12. Set the **Step** slider to the required number of steps for each alarm volume increase.
13. Select the **Increase Intensity** checkbox to activate this function. Clear the checkbox to deactivate.
14. Press **Discard Changes** to close the panel without applying any changes made
    –or–
    Press **Main Screen** to apply the changes and exit to the main screen.

Sound Event

Sound events are audio messages that are heard when certain events occur. Sound files are supplied for the following events:

- When performing cardiac output, the message “Inject now” is heard at injection time (CO Inject.wav).
- When performing Wedge Pressure procedure (PCWP), the audio message “Deflate balloon” is heard when it is time to deflate the balloon (PCWPTimeOut.wav).
- When starting up the computer (StartUp.wav).

- NIBP Success (NIBP Success.wav).
- NIPB Fail (NIPB Fail.wav).
- Use the Sound Event panel to assign sound files to events at the Menntor X7, and to define the volume of the sound.

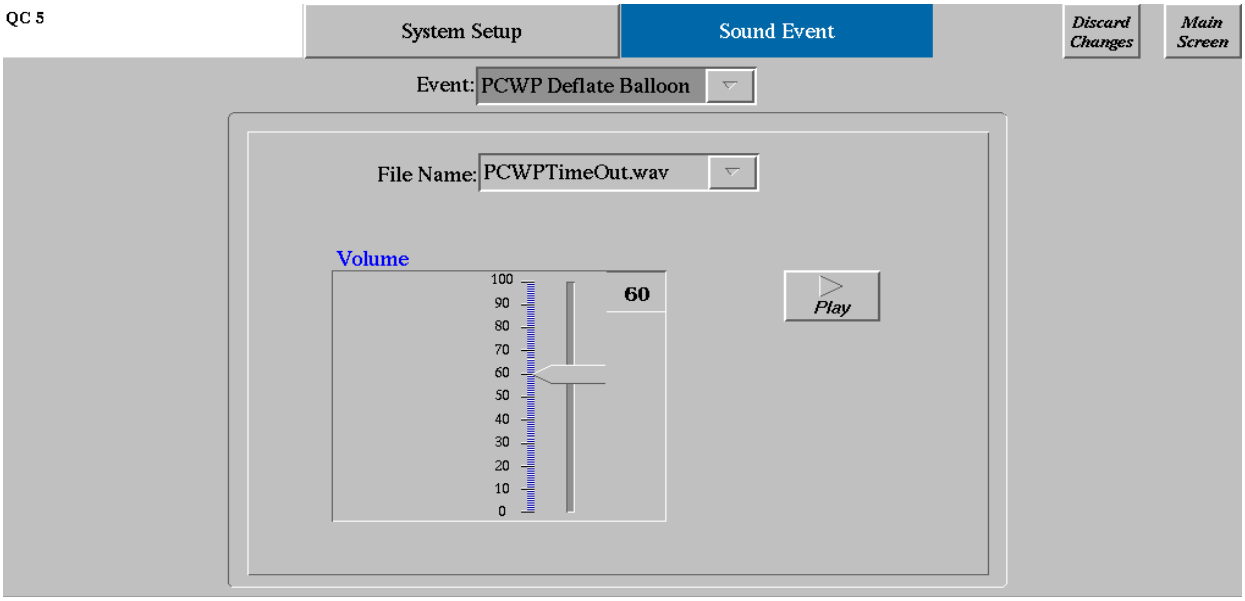


Figure D-5: The Sound Event Panel

➤ ***To configure sound events:***

1. From the **System Setup** menu, select **Sound Event**. The **Sound Event** panel is displayed.
2. In the **Event** list, select the event to which you want to assign an audio message.
3. Under the **File Name** list appear all sound files, including technical and clinical alarms. Select the sound file that will supply the sound for the selected event.
4. Under **Volume**, set the required volume, and click **Play** to test the sound file.
5. Click **Main Screen** to save settings and close the dialog box.

Note: *Factory default setting is for Volume = 60 for* ***Inject Now*** *and* ***Deflate Balloon****, and Volume = 0 for all other events.*

Default Alarm Limits

Each vital signs available for monitoring appears as a button on the **Default Alarm Limits** panel. The current alarm limits for each vital sign are also displayed on the

button. Select a vital sign. The appropriate scale is displayed where you can set new default alarm limits for the selected vital sign. You can select Fixed or Dynamic Alarm Limits. When Dynamic Alarm Limits is selected, the alarm limits change according to the patient's vital signs, when **Set to Default** is activated.

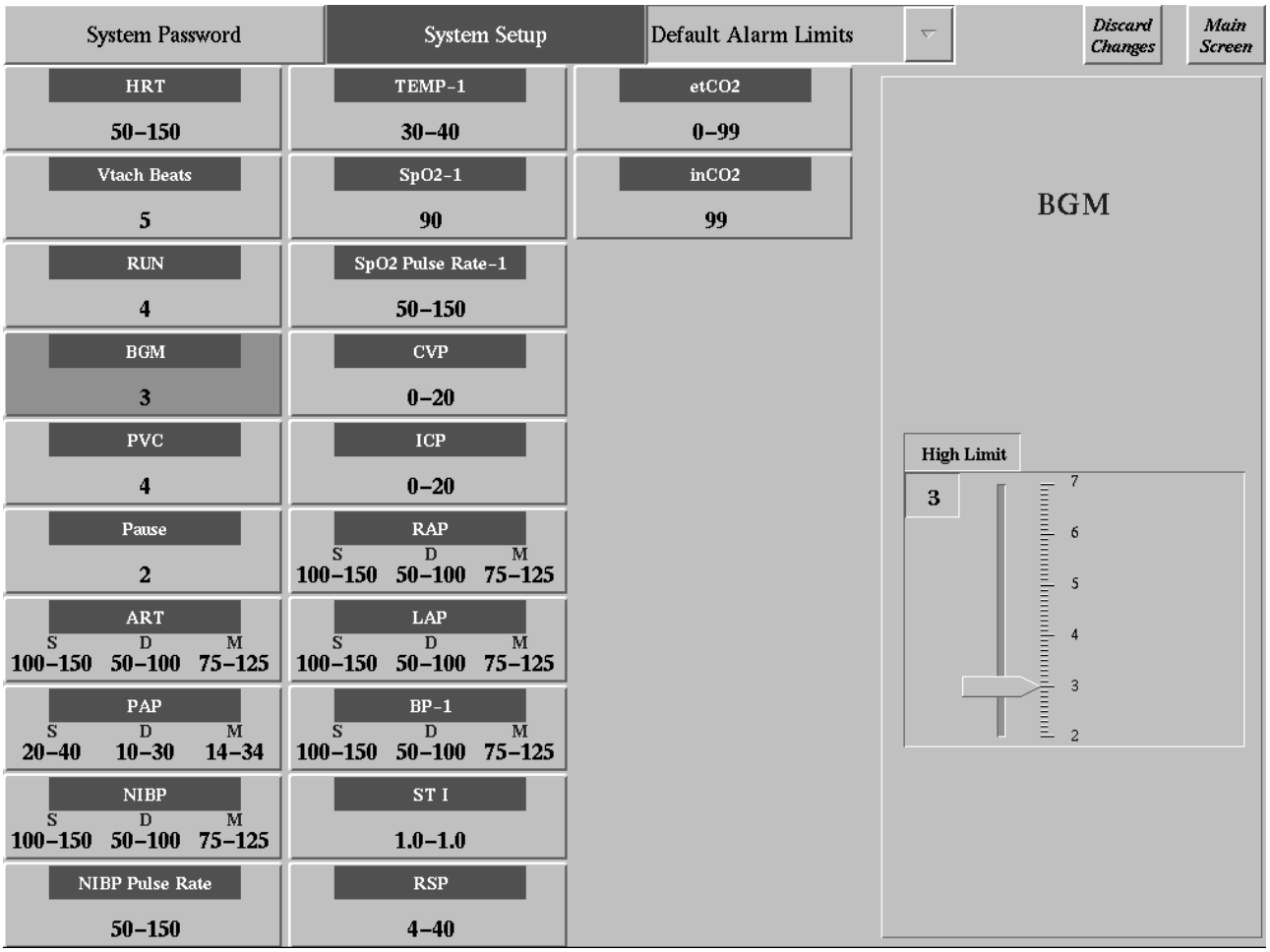


Figure D-6: The Default Alarm Limits Panel

➤ ***To set default alarm limits:***

1. Turn the QuicKnob™ until the required vital sign is highlighted and press. The appropriate options and scale are displayed on the right side of the dialog panel.
2. Under Default Type, select Fixed or Dynamic.
3. Select Pressure Type (for BPs).
4. Select the required limit (high or low), highlight the required slider with the QuicKnob™ and turn the QuicKnob™ clockwise or counter-clockwise to move the slider to the required alarm limit. Press in the QuicKnob™ to set the limit.

5. When done, press the **Escape** button on the front panel to return to the **Vital Sign** list.
6. Repeat steps 1-5 until you have set alarm limits for all required vital signs.
7. Select **Discard Changes** to close the panel without applying any changes,
   –or–
   Select **Main Screen** to apply the changes and close the panel.

Event Setup

Use the Event Setup panel to create or modify Event labels, and to determine the response to activation of the “Mark Event” key .

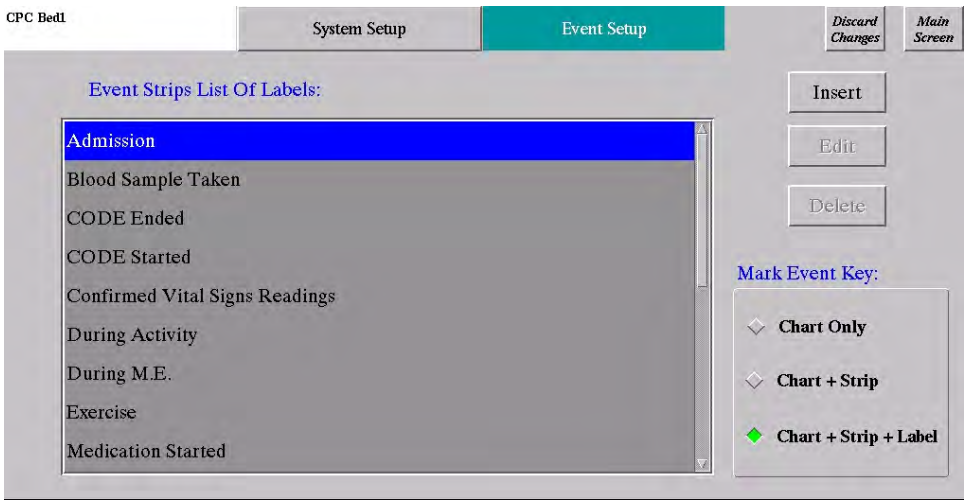


Figure D-7: The Event Setup Panel

➤ ***To Insert a new label:***

1. Select the Event Strip List in the Mark Event panel - it turns green
2. Select a Label
3. Select Insert - this opens the virtual keyboard on the Menntor X7 screen
4. Prepare a label and press Accept
5. The new label is added above the selected label (item 2)

➤ ***To Delete a label:***

1. Select the Event Strip List in the Mark Event panel - it turns green
2. Select a Label
3. Select Delete – this deletes the label

➤ ***To Edit a label:***

1. Select the Event Strip List in the Mark Event panel - it turns green
2. Select a Label
3. Select Edit - this opens the virtual keyboard on the Menntor X7 screen
4. Edit the label and press Accept
5. The new label will replace selected label

➤ ***To set the response to the Mark Event Key:***

Three response options are available:

Chart only

Chart + Strip

Chart + Strip + Label

Chart

A row of vital signs at the time of Mark Event activation is added to the charts. The row is by a green dot.

Chart + Strip

In addition to the above, an Event Strip is stored in the monitor and is labeled as "Manual Event."

The Event strip starts 10 seconds before the time at which you press the Mark Event Key, and ends 10 seconds after the time at which you pressed the above key.

Chart + Strip + Label

In addition to the above, a list of labels is displayed on the monitor screen. The user can now select one of the labels for the event.

The event timing depends on the time of button activation and not on the time of the labeling.

NIBP Leakage Test

Use the Leakage Test to test the leakage of the NIBP module including the patient cuff.

➤ ***To test NIBP Leakage***

1. To start the test, disconnect the cuff from the patient, rap the cuff around itself

2. Press “Leakage Test” --- A password panel will open
3. Enter the password – The test panel will open. The test panel contains a warning message : “Disconnect Patient from Cuff before Testing”
4. Be sure that the cuff is not connected to a patient and press “Test”
5. The module will inflate the cuff to a pressure of about 200 mmHg for adult cuff, or about 120 mmHg for neonatal cuff.
6. After that all internal valves will be closed and the leakage will be tested for total time of 4 minutes
7. The test results are displayed as : “Pressure after 1 minute” of inflation and “Pressure Difference” that is the pressure drop between the Initial pressure at 1 minute and the final pressure 3 minutes later.

Note: *If you assume that the leakage is in internal parts of the module, start the test with a cuff connected, and at about 1 minute close the cuff tube near the pressure outlet using a surgical clamp.*

Vital Sign (VS) Setup

The Vital Signs Setup menus enable you to set default parameters for each vital sign available for monitoring in the Menntor X7 bedside monitor. These include alarm parameters and other parameters specific to the monitored vital sign.

The **Vital Signs Setup** menu enables you to access the following dialog panels:

- ECG Setup
- Respiration Setup
- BP Setup
- NIBP Setup
- SpO2 Setup
- Temperature Setup
- CritiCool Setup
- EtCO2 Setup
- CO Setup
- cGas Setup
- CO2 Setup
- O2 Setup
- N2O Setup
- Agent Setup
- Ventilator Setup

- SvO2

Accessing the Vital Signs Setup Dialog Panels

A dialog panel is provided for each available vital sign. You can access these dialog panels from the **Vital Sign Setup** menu.

➤ ***To access the Vital Sign Setup menu:***

1. In the **System Setup** menu, select **Vital Signs Setup**. The menu is displayed.
2. Select the vital sign for which you want to set defaults. The appropriate dialog panel is displayed.

ECG Setup

This dialog panel enables you to set ECG default parameters. These parameters include:

- **Alarm priorities for Heart Rate, Fault and Pacemaker alarms**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  Heart Rate alarm priority can be set at a level of either C-1 or C-2. The factory setting is C-1.

- **Alarm Latching**

  For a complete description of Alarm Latching, (see “Latched Alarms” on page 8-7). The available options are **Off**, **Visual** (latching visual alarms only), and **On** (both visual and audible alarms). The factory default is **Off**.

- **Arrhythmia Package**

  Enables you to determine the level of Arrhythmia analysis. The available levels are: **Basic** (includes Asystole, Vfib, V-tach, Run, PVC, and Pause) and **Extended** (includes Bradycardia, Supraventricular Tachycardia, SV Irregular Rhythm, Idioventricular Rhythm, Couplets of PVCs, Triplets of PVCs, Bigeminy, Trigeminy, R on T, PVC, Vfib, V-Tach, Multifocal PVCs, Interpolated PVCs, Asystole, Run, Pause, Premature Artrial Contraction, and Sinus Tachycardia).

- **Arrhythmia Priority**

  Enables you to set default priority levels for all available Arrhythmia alarms. The available alarm priorities are as follows:

Table D-3: Arrhythmia Alarm Priorities

Arrhythmia	*C-1*	*C-2*	*C-3*	*Default Priority*
Asystole	X			C-1
Ventricular Fibrillation (VFIB)	X			C-1
Ventricular Tachycardia (VTACH)	X			C-1
Runs of PVC beats (RUN)	X	X		C-2
Bigeminy (BGM)	X	X	X	C-2
PVC beats per minute (PVC)	X	X	X	C-2
Pause Event (PAUSE)	X	X	X	C-3
Bradycardia (BRADY)	X			C-1
Tachycardia (TACHY)	X			C-1
Irregular Rhythm (IRREGULAR)	X	X	X	C-2
Idioventricular Rhythm (IDIOVENT)	X	X	X	C-2
Couplets of PVCs (COUPLET)	X	X	X	C-2
Triplets of PVCs (TRIPLET)	X	X	X	C-2
Trigeminy (TRIGEM)	X	X	X	C-2
R on T	X	X	X	C-2
Premature Atrial Contraction (PAC)	X	X	X	C-2
Atrial Fibrillation (AFIB)	X	X	X	C-2
Supraventricular Tachycardia (SVTACH)	X	X	X	C-2
Multi-focal PVCs (MULTIFOCAL)	X	X	X	C-2
Interpolated PVCs (INTPVC)	X	X	X	C-2

- **Alarm Detection Delay**

When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, 10, 15 or 20 seconds.
The factory default is set to 5 seconds.

•Default Color

Defines the color in which ECG vital signs and waveforms appear on the main screen display. You have a choice of 16 colors. The factory default color is yellow.

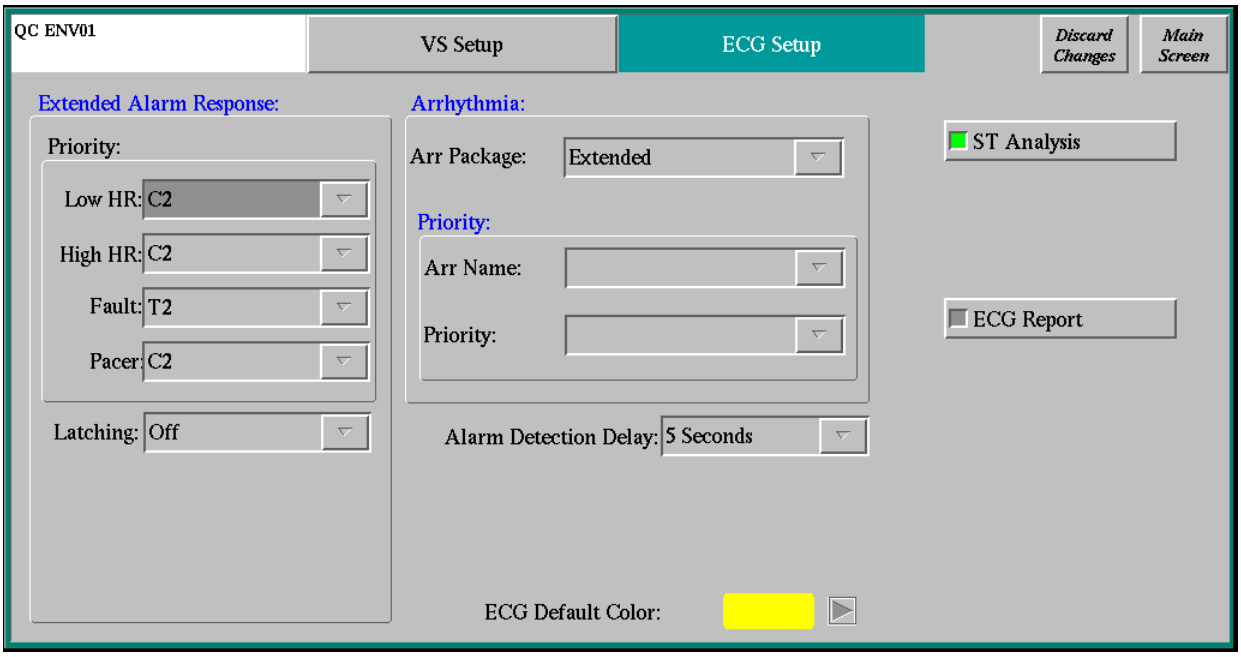


Figure D-8: The ECG Setup Panel

➤ ***To define ECG default parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **ECG Setup**. The **ECG Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - From the appropriate drop-down list, set the priority levels for **Heart Rate**, **Faults** and **Pacer**.
   - From the **Latching** drop-down list, set alarm latching to **On** or **Off**.
4. Under **Arrhythmia**, select the Arrhythmia Package that you want.
5. Under **Arr Priority**:
   - From the **Arr Name** drop-down list, select the type of arrhythmia for which you want to set alarm priority.
   - From the **Priority** drop-down list, select the priority level for the selected

type of arrhythmia.

6. ST analysis: Toggle on (green) if you wish ST to be functional, or off to prevent activation of ST measurement.
7. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
8. Select **ECG Default Color**. A panel displaying all available colors appears. Select the required color. The panel closes.
9. Select **Discard Changes** to close the **ECG Setup** panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue* **System Setup**, you must press the **System Setup** button again to access the **System Setup** menu.

Respiration Setup

This dialog panel enables you to set Respiration default parameters. These parameters include:

•Alarm priorities for Resp Rate, Apnea and alarms

Alarm priority affects the order of audible and visual alarm notification.
See “Alarm Priority” on page 8-4 for a full description of this feature.

Resp Rate, **Apnea**, and alarm priority can be set at a level of **C-1**, **C-2**, or **C-3**. The factory defaults are as follows:

Resp Rate: C-2

Apnea: C-2

•Alarm Latching

For a complete description of Alarm Latching, see “Latched Alarms” on page 8-7. The available options are Off, Visual (latching visual alarms only), and **On** (both visual and audible alarms). The factory default is **Off**.

•Alarm Detection Delay

When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, or 10 seconds. The factory default is set to 5 seconds.

•Apnea Reset

Defines the default number of breaths the system uses to reset the apnea timer. The available options are; **2 breaths**, **3 breaths**, and **4 breaths**.

•Default Color

Defines the color in which Respiration vital signs values and waveforms appear on the main screen display. You have a choice of 16 colors. The factory default color is green.

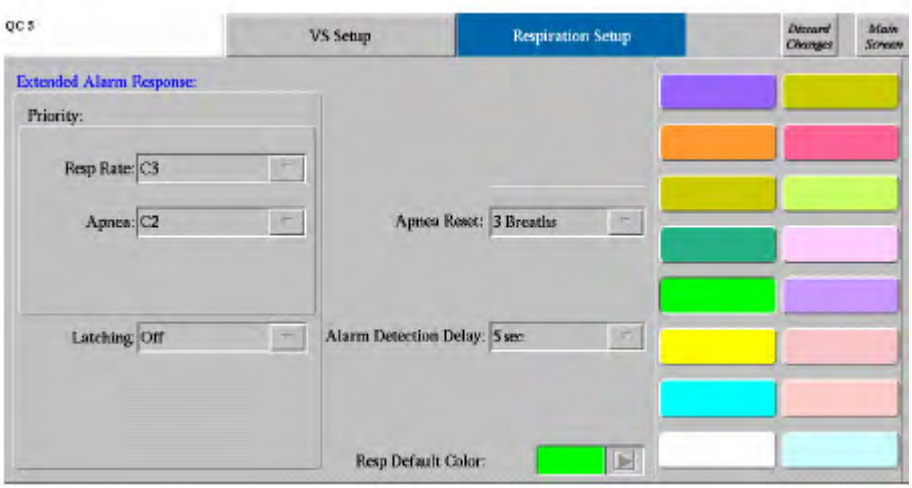


Figure D-9: The Respiration Setup Panel

➤ ***To define Respiration default parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **Respiration Setup**. The **Respiration Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - From the appropriate drop-down list, set the default priority levels for **Resp Rate** and **Apnea**.
   - From the **Latching** drop-down list, set default alarm latching to **On** or **Off**.
4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. From the **Apnea Reset** drop-down list, select the number of breaths required to reset the Apnea timer.
6. Select **Respiration Default Color**. A panel displaying all available colors appears. Select the required color. The panel closes.
7. Select **Discard Changes** to close the **Respiration Setup** panel without applying any changes

–or–

Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue* **System Setup**, you must press the **System Setup** button again to access the **System Setup** menu.

BP Setup

This dialog panel enables you to set BP default parameters. These parameters include general default values applicable to all BPs and default values applicable to a specific BP site (such as ART, CVP, etc.)

General BP Default Parameters

- **Alarm priorities for BP, and Fault alarms**

Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

BP alarm priority can be set to C-1, C-2, or C-3. The factory default is C-2.

Fault alarm priority can be set to T-1, or T-2. The factory default is T-1.

- **Alarm Latching**

For a complete description of Alarm Latching, see “Latched Alarms” on page 8-7. The available options are **Off**, **Visual** (latching visual alarms only), and **On** (both visual and audible alarms). The factory default is **Off**.

- **Alarm Detection Delay**

When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, 10, 15 or 20 seconds. The factory default is set to 5 seconds.

- **Auto Scale**

Automatically sets the range of the BP waveform on the main screen display.

After Zero enables you to specify if autoscaling is done automatically after the BP is zeroed and in which cases. The available options are; **Always**, **Never**, and **Only After First Zero**. Under **Type**, you can define the type of autoscaling implemented. The available options are; **Normal**, and **Only Upper Limit** (meaning that the lower scale limits should be kept).

BP Site-Specific Default Parameters

- **Defaults per Site Name**

  Defines the site for which the site-specific parameters are being set.

- **Units**

Determines the units used to measure the selected BP. The available options are; **mmHg**, **Kpa**, and **cm H_20**. The factory default is **mmHg**.

- **Numeric Formats**

  Determines the numeric format in which the selected BP is displayed.

  When units are defined as **mmHg**, the available options are: **SSS/DDD MMM**, **SSS/DDD mmm**, and **SSS/DDD**. The factory default is **SSS/DDD MMM**.

  When units are defined in **Kpa**, the available options are: **SS.S/DD.D**, and **MM.M**. The factory default is **SS.S/DD.D MM.M.**

- **Manual Scale**

  Defines the default high and low scale limits for use when implementing manual scaling. The available options are as follows:

  - High Scale - 250, 300 and 350
  - Low Scale: -15, -10, and 0

- **BP Default Color**

  Defines the color in which BP vital signs values and waveforms appear on the main screen display. You have a choice of 16 colors. The factory default colors are as follows:

  - ART/UA - Pink
  - PAP - Light Blue
  - CVP - Orange
  - All others - Grey or Silver

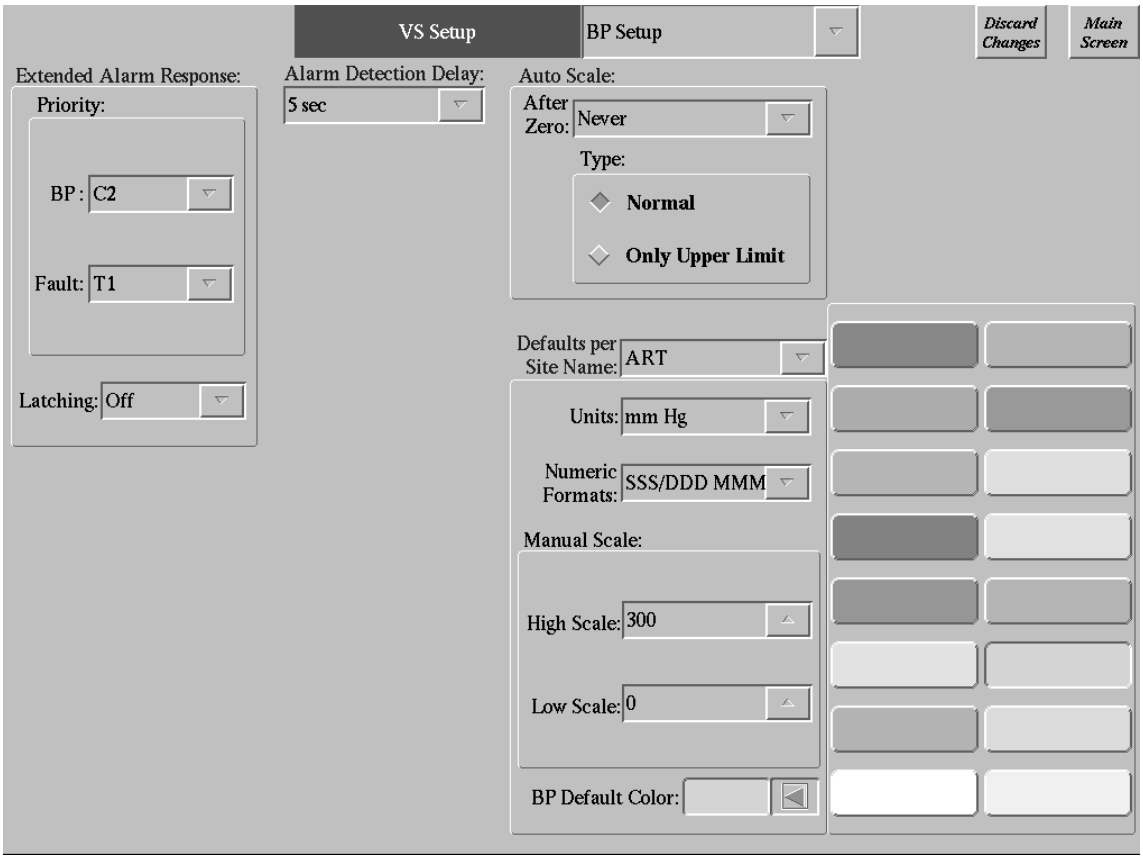


Figure D-10: The BP Setup Dialog Panel Displaying the Color Selection Panel

➢ ***To define default BP parameters***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.

2. From the **Vital Signs** menu, select **BP Setup**. The **BP Setup** dialog panel is displayed.

3. Under **Extended Alarm Response**:

   - From the appropriate drop-down list, set the default priority levels for **BP** and **Fault** alarms.
   - From the **Latching** drop-down list, set default alarm latching to **On** or **Off**.

4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).

5. Under **Auto Scale**:

   - From the After Zero drop-down list, select Always, Never, or Only After First Zero.
   - Under Type, select Normal, or Only Upper Limit.

6. From the **Defaults Per Site Name** drop-down list, select the BP for which you want to set site-specific default values.
7. From the **Units** drop-down list, select the type of units used to measure the selected BP.
8. From the **Numeric Formats** drop-down list, select the required format in which to display the BP reading.
9. Under **Manual Scale**; from the **High**/**Low Scale** drop-down lists, select the required upper/lower limits for manual scaling.
10. Select **BP Default Color**. A panel displaying all available colors appears. Select the required color. The panel closes.
11. Select **Discard Changes** to close the **BP Setup** panel without applying any changes
    –or–
    Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue* **System Setup**, you must press the **System Setup** button again to access the **System Setup** menu.

NIBP Setup

This dialog panel enables you to set NIBP default parameters. These parameters include setting alarm priority for both **NIBP** and **Pulse Rate** alarms, defining the default cuff type for the monitor, setting reading intervals and specifying the measurement units used to display NIBP values.

- **Alarm priorities for NIBP**

Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

NIBP alarm priority can be set to C-1, C-2, or C-3. The factory default is C-1.

- **Alarm Latching**

For a complete description of Alarm Latching, refer to Chapter 7, “Alarms” in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Cuff Type**

Defines the default cuff type to be used by the Menntor X7. The available cuff types are Adult or Neonatal. The factory default is Adult.

- **Reading Intervals**

Use to set defaults for T and Q intervals. Refer to Chapter 11, “NIBP Monitoring” in the *Menntor X7 Operation Manual* for a complete description of this concept.

Use Single T Mode or Single Q Mode to simplify the interval selection by showing only one timed mode.

- **Units**

Determines the units used to measure NIBP. The available options are; mmHg, Kpa, and cm H_20. The factory default is mmHg.

- **Numeric Formats**

Determines the numeric format in which the NIBP reading is displayed.

When units are defined as mmHg, the available options are; SSS/DDD MMM, SSS/DDD mmm, and SSS/DDD. The factory default is SSS/DDD MMM.

When units are defined in Kpa, the available options are: SS.S/DD.D, and MM.M. The factory default is SS.S/DD.D

- **NIBP Default Color**

Defines the color in which NIBP values appear on the main screen display. You can choose from 16 available colors.

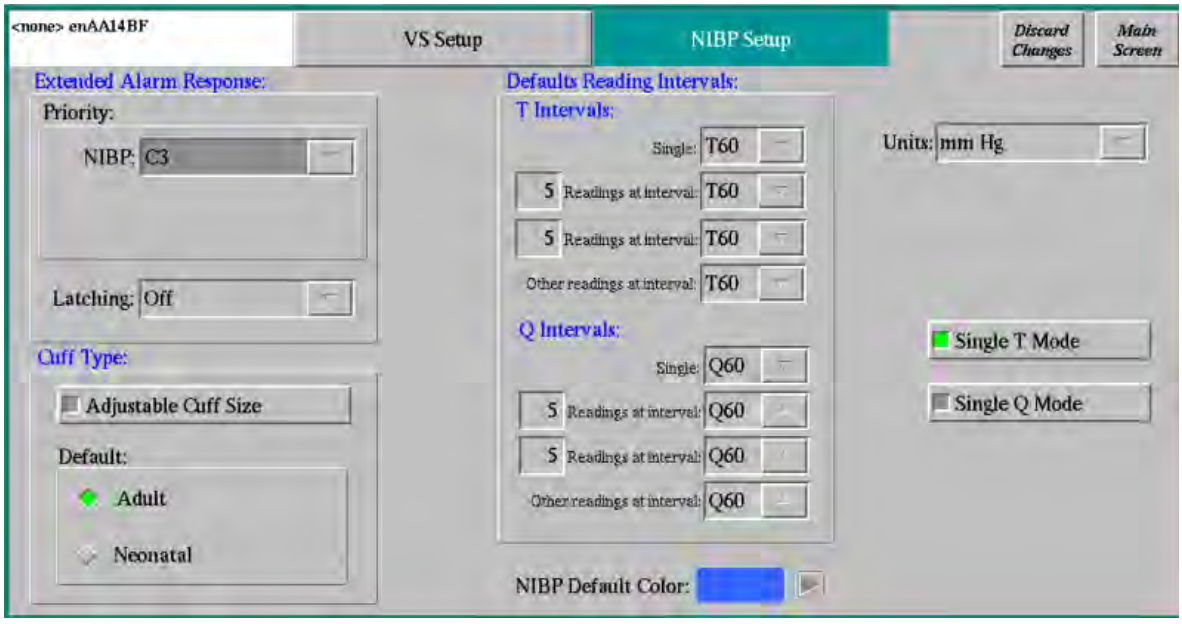


Figure D-11: The NIBP Setup Dialog Panel

➤ ***To set NIBP default parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.

2. From the **Vital Signs** menu, select **BP Setup**. The **BP Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - From the appropriate drop-down list, set the default priority levels for **NIBP** alarms.
   - From the **Latching** drop-down list, set default alarm latching to **On** or **Off**.
4. Under **Cuff Type**:
   - Select the **Adjustable Cuff Size** checkbox to enable user access to the **Cuff Type** panel. Clear the checkbox **Adjustable Cuff Type** to remove the **Cuff Type** menu item from the NIBP menu.
   - Select the default cuff type, **Adult** or **Neonatal**.
5. Under **Default Reading Intervals**, set the required parameters for T and Q intervals.
6. From the **Units** drop-down list, select the type of units used to measure NIBP.
7. From the **Numeric Formats** drop-down list, select the required format in which to display the NIBP reading.
8. Select **NIBP Default Color**. A panel displaying all available colors appears. Select the required color.
9. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

Note: *It is possible to simplify the use of NIBP timing by selecting either Single T or Single Q. If this is selected only single timing mode will be available.*

SpO2 Setup

This dialog panel enables you to set SpO2 default parameters. These parameters include setting alarm priority for SpO2, Pulse Rate and Fault alarms, activating or deactivating alarm latching, defining Alarm Detection delay and disabling SpO2 alarms during NIBP readings.

- Alarm priorities for SpO2, Pulse Rate, and Fault alarms

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  SpO2 and Pulse Rate alarm priority can be set to C-1, C-2, or C-3. The factory default for both parameters is C-1.

  Fault alarm priority can be set to T-1 or T-2. The factory default is T-1.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms” in the “Menntor X7 Operation Manual”. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Response Time**

  When an alarm is detected, a pre-defined response time allows the system to check in order to avoid false alarms. The delay can be set to 3, 6, or 12 seconds. The factory default is set to 6 seconds.

- **SpO2 Default Color**

  Defines the color in which SpO2 values appear on the main screen display. You can choose from 16 available colors.

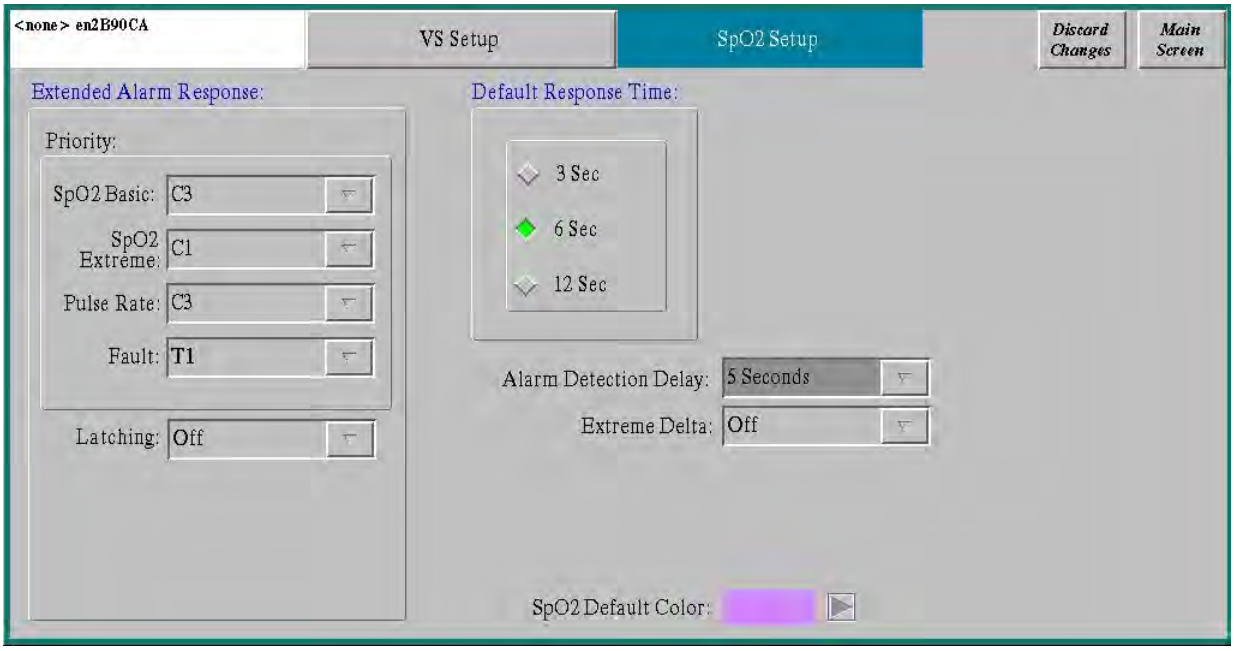


Figure D-12: The SpO2 Setup Dialog Panel

➤ ***To set SpO2 default parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **BP Setup**. The **BP Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - From the appropriate drop-down list, set the default priority levels for **SpO2**, **Pulse Rate**, and **Fault** alarms.
   - From the **Latching** drop-down list, set default alarm latching to **On** or **Off**.
4. Select the **Disable SpO2 Alarms During NIBP** checkbox to stop detection of SpO2 alarms (if monitored) while taking an NIBP reading. Clear the checkbox to reactivate SpO2 alarms.
5. From the **Alarm Detection Delay** drop-down list, select the required delay time in seconds (default is 5 sec.).
6. Set **Extreme Delta** to set an Extreme SpO2 alarm if SpO2 is below the low alarm setting by more than X% (X=1% to 10 %) . Default is Off.
7. Select **SpO2 Default Color**. A panel displaying all available colors appears. Select the required color.
8. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

Temperature Setup

This dialog panel enables you to set Temperature default parameters. These parameters include setting Temperature alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default color for Temperature values.

- **Temperature Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  Temperature alarm priority can be set to C-1, C-2, C-3 or C-4. The factory default is C-4.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5,10, 15 or 20 seconds. The factory default is set to 5 seconds.

- **Units**

  Defines the default units used to measure and display temperature. The available options are Celsius or Fahrenheit. The factory default is Celsius.

- **Temperature Default Color**

  Defines the color in which Temperature values appear on the main screen display. You can choose from 16 available colors.

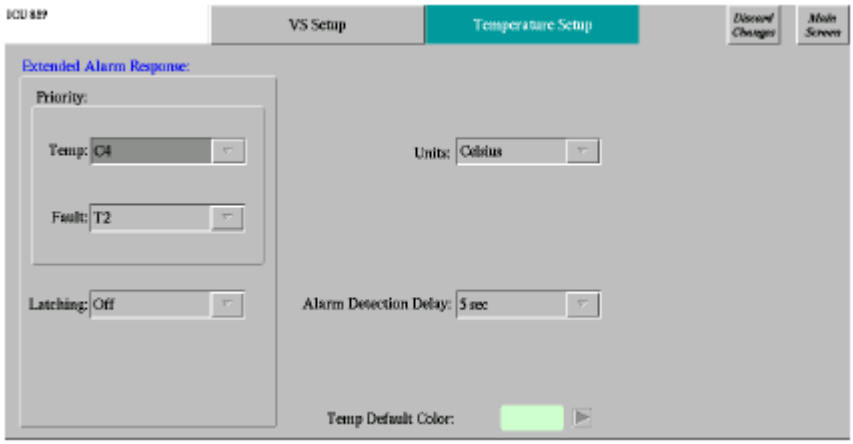


Figure D-13: The Temperature Dialog Panel

➤ ***To set default Temperature parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **Temperature Setup**. The Temperature Setup dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - From the **Temp** drop-down list, set the default priority level for temperature alarms.

- From the **Latching** drop-down list, set default alarm latching to On or Off.

4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. From the **Units** drop-down list, select the required default measurement unit (Celsius or Fahrenheit).
6. Select **Temperature Default Color**. A panel displaying all available colors appears. Select the required color.
7. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

CritiCool Setup

This dialog panel enables you to set CritiCool Pro default parameters. These parameters include neonatal and adult default settings and temperature units.

Figure D-14 show the CritiCool setup panel.

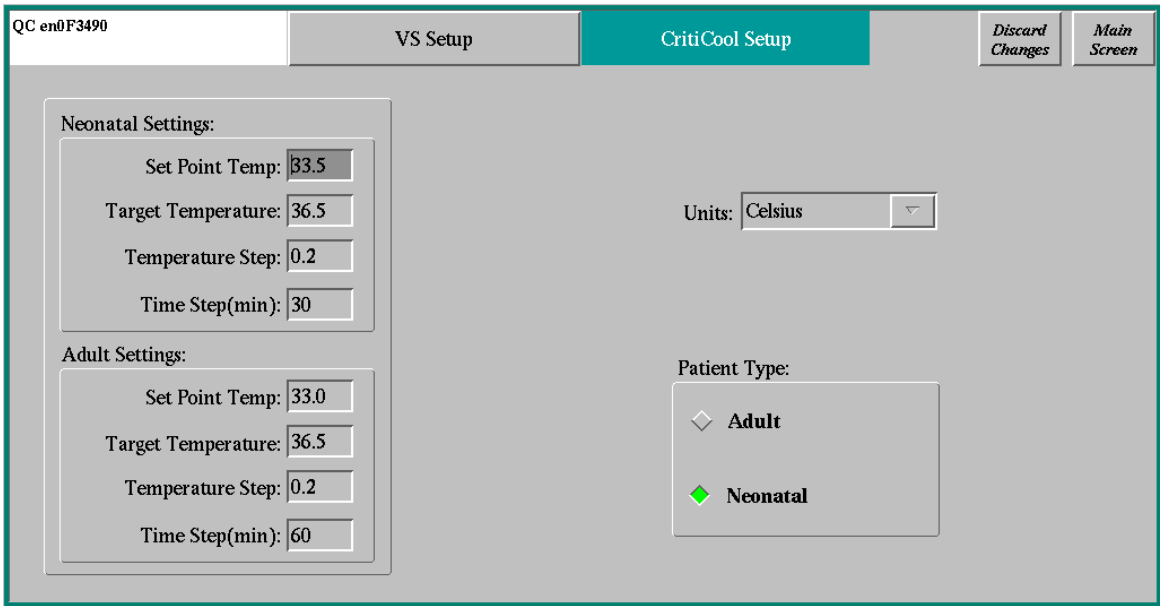


Figure D-14: CritiCool Setup.

Note: *For instruction for use of the Menntor X7 to control the CritiCool Thermoregulation System, refer to the MTRE CritiCool Pro User Manual.*

EtCO2 Setup

This dialog panel enables you to set EtCO2 default parameters. These parameters include setting EtCO2 alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default units and color for EtCO2 values.

- **EtCO2 Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  EtCO2 alarm priority can be set to C-1, C-2, or C-3. The factory default is C-2.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 0, 3, 5, 10, 15 or 20 seconds. The factory default is set to 0 seconds.

- **Units**

  Defines the default units used to measure and display EtCO2. The available options are % or mmHg. The factory default is %.

- **EtCO2 Default Color**

  Defines the color in which EtCO2 values appear on the main screen display. You can choose from 16 available colors.

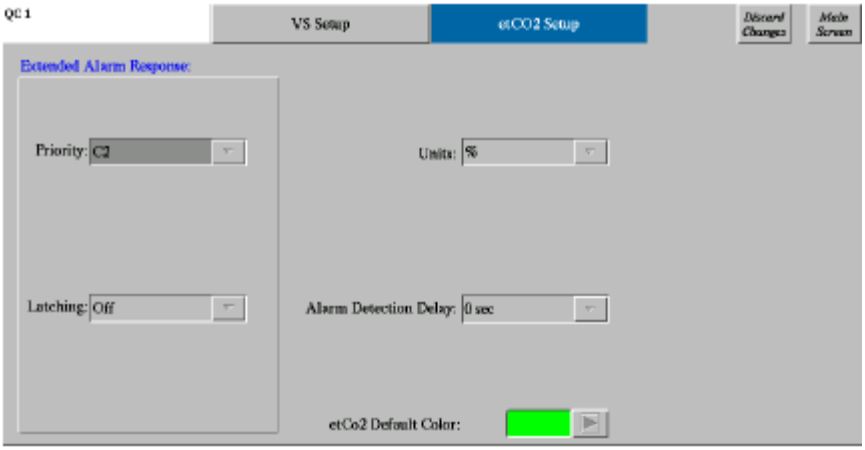


Figure D-15: The EtCO2 Dialog Panel

➤ ***To set default EtCO2 parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **EtCO2 Setup**. The **EtCO2 Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - Set the default priority level for EtCO2 alarms.
   - From the **Latching** drop-down list, set default alarm latching to On or Off.
4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. From the **Units** drop-down list, select the required default measurement unit (% or mmHg).
6. Select **EtCO2 Temperature Default Color**. A panel displaying all available colors appears. Select the required color.
7. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

EtCO2 Calibration

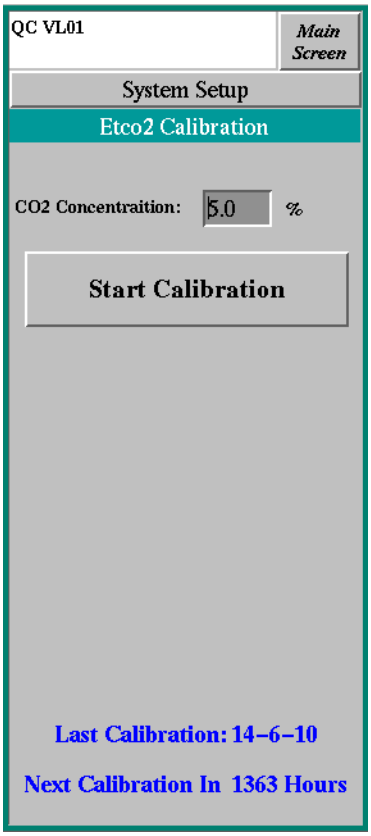


Figure D-16: EtCO2 Calibration panel

For Microstream EtCO2 we have to perform span calibration with standard CO2 concentration after 1200 hours of first use and then once every year.

To perform the calibration use gas mixture 5%, 21%D2m Bal. N2 (Scott Medical Products 6141 Easton Road Box 310, Plumsteadville, PA 18949, (215) 766-8861 Fax: (215) 766-0320).

➤ ***To perform the calibration***

1. In System Setup, select **EtCO2 Calibration** (see Figure D-16).
2. Set the calibration value to 5.0%
3. Open the gas flow and select "**Start Calibration**"
4. After several seconds the calibration will end
5. Stop Gas flow.

Cardiac Output (CO) Setup

This dialog panel enables you to set the CO default color.

CO Default Color

Defines the color in which CO values appear on the main screen display. You can choose from 16 available colors.

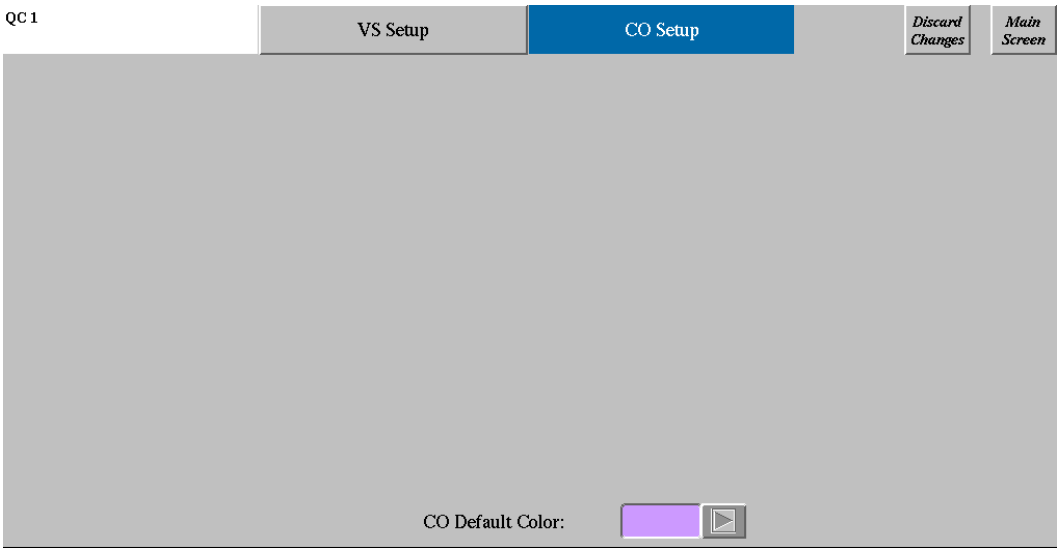


Figure D-17: The CO Dialog Panel

➤ ***To set default CO parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **CO Setup**. The CO **Setup** dialog panel is displayed.
3. Select **CO Default Color**. A panel displaying all available colors appears. Select the required color.
4. Select Discard Changes to close panel without applying any changes
   -or-
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

Transcoutaneous Gas (TcGas) Setup

This dialog panel enables you to set TcGas default parameters. These parameters include setting TcGas alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default units and color for TcGas values.

- **TcGas Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  TcGas alarm priority can be set to C-1, C-2, or C-3. The factory default is C-2. TcGas technical fault priority can be set as T1 or T2. The factory default is T2. The Sensor Temperature alarm priority is set T2.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, or 10 seconds. The factory default is set to 5 seconds.

- **Units**

  Defines the default units used to measure and display temperature. The available options are mmHg or kPa for Tc PO2/ Tc Co2. The factory default is mmHg.
  The sensor temperature unit options are Celsius or Fahrenheit. The factory default is Celsius.

- **TcGas Default Color**

  Defines the color in which TcGas values appear on the main screen display. You can choose from 16 available colors.

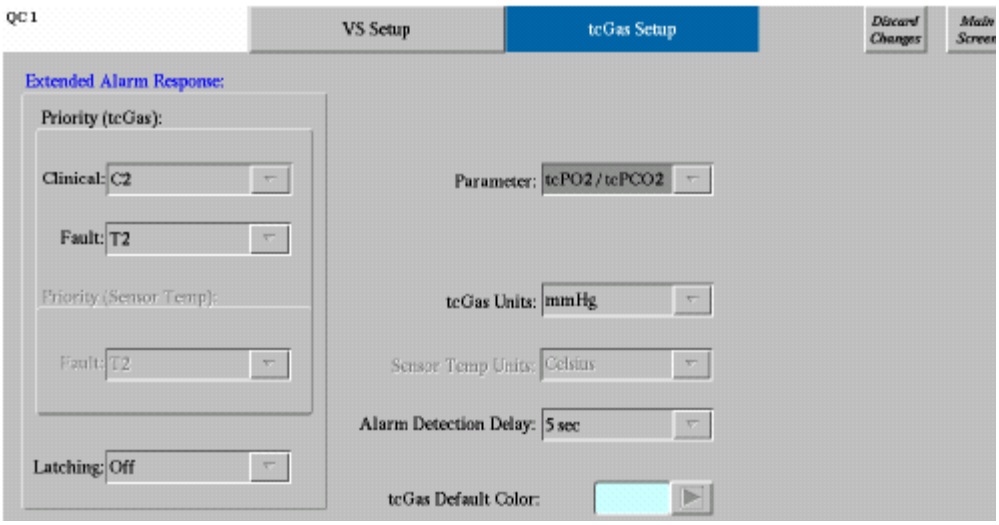


Figure D-18: The TcGas Dialog Panel

➤ ***To set TcGas parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **TcGas Setup**. The **TcGas Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - Set the default priority level for **TcGas** alarms.
   - From the **Latching** drop-down list, set default alarm latching to On or Off.
4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. From the **TcGas** drop-down list, select the required default measurement unit (mmHg or kPa). Select the required default measurement unit (Celsius or Fahrenheit) from the Sensor Temperature units drop down list
6. Select **TcGas Default Color**. A panel displaying all available colors appears. Select the required color.
7. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

CO2 (from Anesthetic Gas) Setup

This dialog panel enables you to set CO2 default parameters. These parameters include setting CO2 alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default units and color for CO2 values.

- **CO2 Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  CO2 alarm priority can be set to C-1, C-2, or C-3. The factory default is C-2.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, 10, 15 or 20 seconds. The factory default is set to 0 seconds.

- **Units**

  Defines the default units used to measure and display CO2. The available options are % or mmHg. The factory default is mmHg.

- **CO2 Default Color**

Defines the color in which CO2 values appear on the main screen display. You can

choose from 16 available colors.

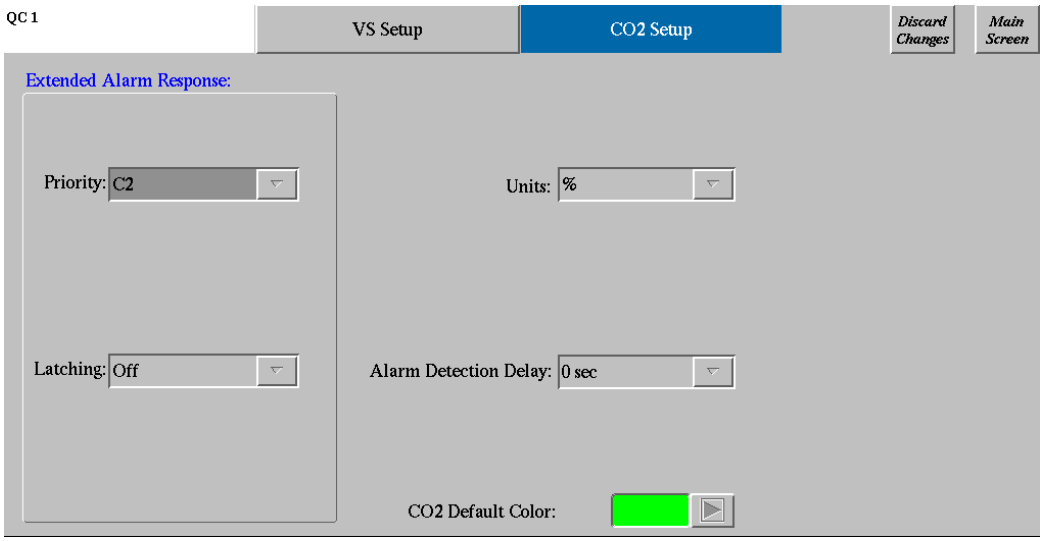


Figure D-19: The CO2 Dialog Panel

➤ ***To set default CO2 parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select **CO2 Setup**. The **CO2 Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - Set the default priority level for Co2 alarms.
   - From the **Latching** drop-down list, set default alarm latching to On or Off.
4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. From the **Units** drop-down list, select the required default measurement unit (% or mmHg).
6. Select **CO2 Default Color**. A panel displaying all available
7. colors appears. Select the required color.
8. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

O2 Setup

This dialog panel enables you to set O2 default parameters. These parameters include setting O2 alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default units and color for O2 values.

- **O2 Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  O2 alarm priority can be set to C-1, C-2, or C-3. The factory default is C-2.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, 10, 15 or 20 seconds. The factory default is set to 0 seconds.

- **O2 Default Color**

Defines the color in which O2 values appear on the main screen display. You can choose from 16 available colors.

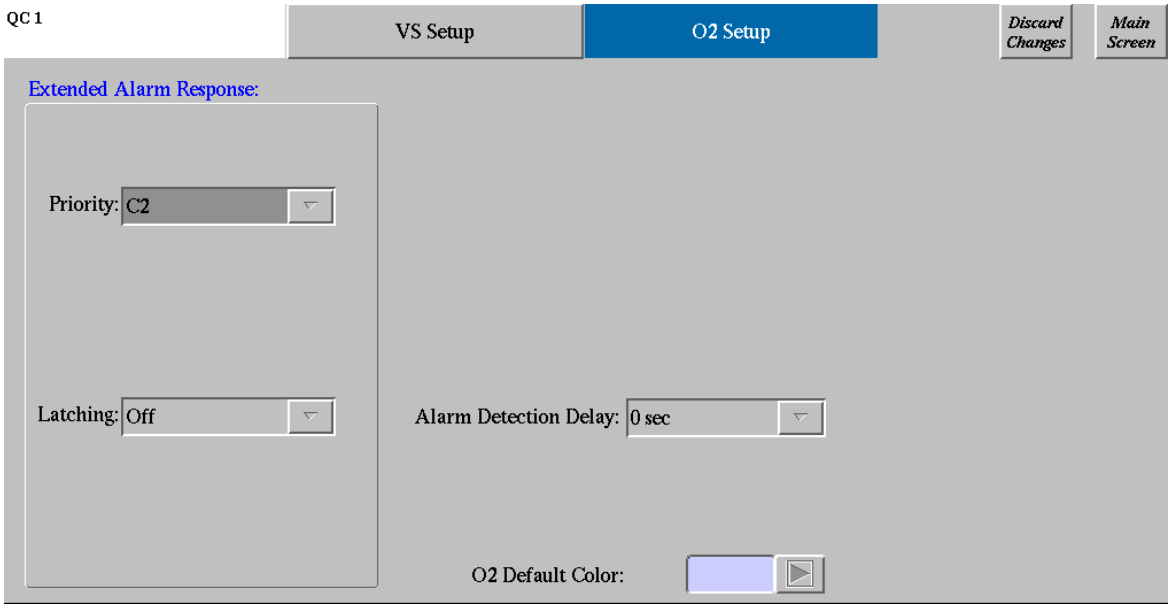


Figure D-20: The O2 Dialog Panel

➤ ***To set default O2 parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**.
   The **Vital Signs** menu is displayed.

2. From the **Vital Signs** menu, select **O2 Setup**.
   The **O2 Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - Set the default priority level for O2 alarms.
   - From the **Latching** drop-down list, set default alarm latching to On or Off.
4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. Select **O2 Default Color**. A panel displaying all available
6. colors appears. Select the required color.
7. 6.Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

N2O Setup

This dialog panel enables you to set N2O default parameters. These parameters include setting N2O alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default units and color for N2O values.

- **N2O Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  N2O alarm priority can be set to C-1, C-2, or C-3. The factory default is C-2.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, 10, 15 or 20 seconds. The factory default is set to 0 seconds.

- **N2O Default Color**

Defines the color in which N2O values appear on the main screen display. You can choose from 16 available colors.

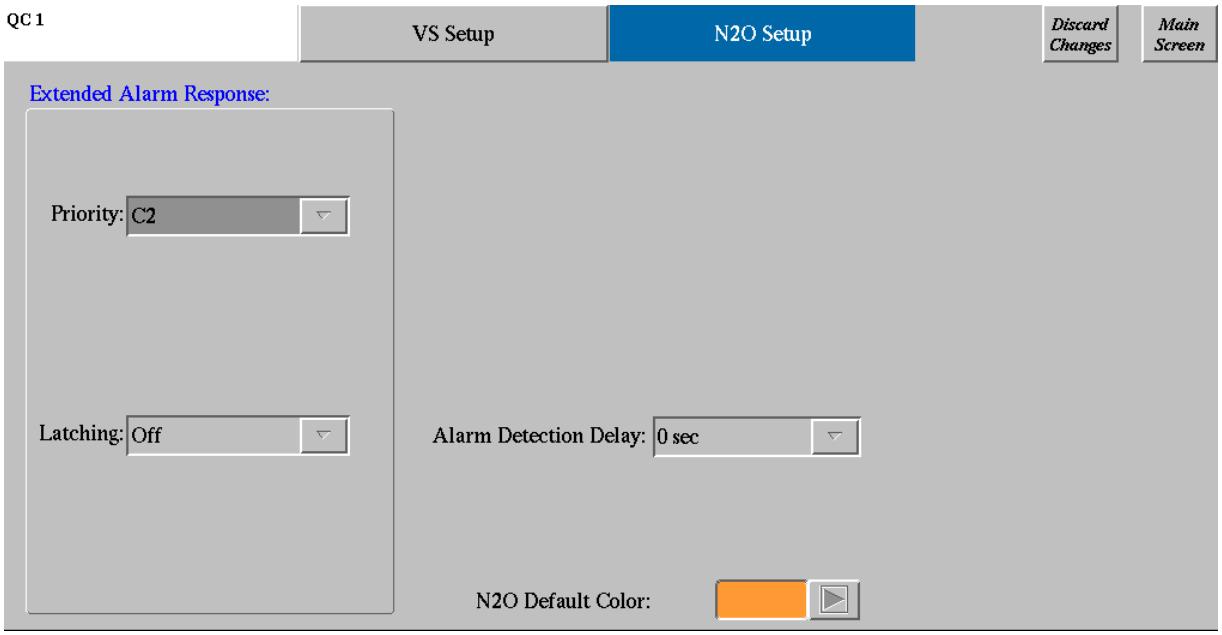


Figure D-21: The N2O Dialog Panel

➤ ***To set default N2O parameters:***

1. 1.From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. 2.From the **Vital Signs** menu, select **N2O Setup**. The **N2O Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - Set the default priority level for **N2O** alarms.
   - From the **Latching** drop-down list, set default alarm latching to On or Off.
4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. 5.Select **N2O Default Color**. A panel displaying all available

6. colors appears. Select the required color.
7. 6.Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

Anesthetic Agent Setup

This dialog panel enables you to set Anesthetic Agent default parameters. These parameters include setting Anesthetic Agent alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default units and color for Anesthetic Agent values.

- **Anesthetic Agent Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 fr a full description of this feature.

  Anesthetic Agent alarm priority can be set to C-1, C-2, or C-3. The factory default is C-2.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, 10, 15 or 20 seconds. The factory default is set to 10 seconds.

- **Anesthetic Agent Default Color**

Defines the color in which Anesthetic Agent values appear on the main screen display. You can choose from 16 available colors.

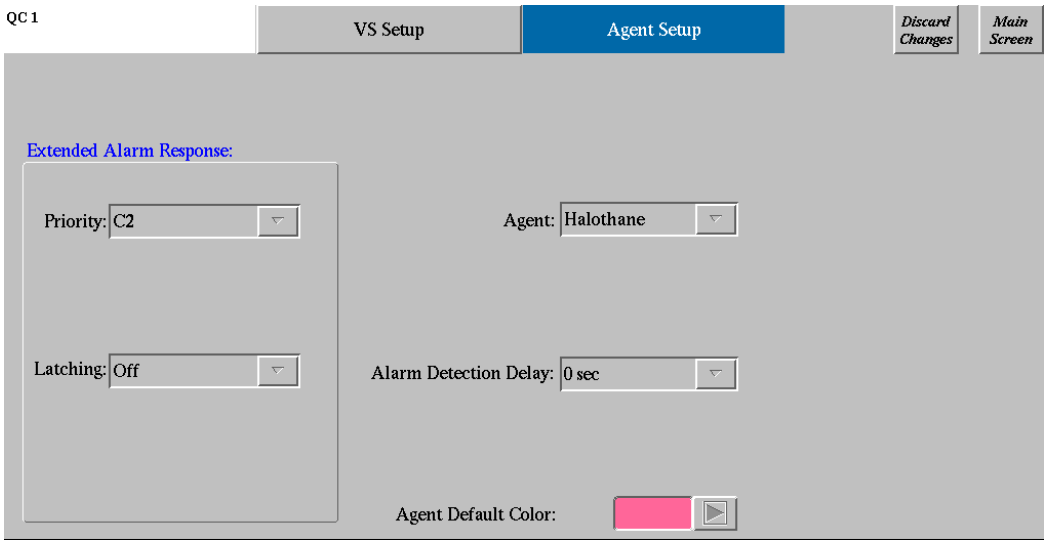


Figure D-22: The Anesthetic Agent Dialog Panel

➤ ***To set default Anesthetic Agent parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select Anesthetic Agent **Setup**. The Anesthetic Agent **Setup** dialog panel is displayed.
   Under **Extended Alarm Response**:
   - Set the default priority level for Anesthetic Agent alarms.
   - From the **Latching** drop-down list, set default alarm latching to On or Off.
3. From the Anesthetic Agent drop down list, select either one of the 5 Anesthetic Agents or select Automatic for automatic selection of the Agent.
4. From the **Alarm Detection Delay** drop-down list, select the required delay time (in seconds).
5. Select **Agent Default Color**. A panel displaying all available colors appears. Select the required color.
6. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

Ventilator Setup

This dialog panel enables you to set Ventilator default parameters. These parameters include setting Ventilator alarm priority activating or deactivating alarm latching, defining Alarm Detection delay and selecting the default units and color for Ventilator values.

- **Ventilator Alarm Priority**

  Alarm priority affects the order of audible and visual alarm notification. See “Alarm Priority” on page 8-4 for a full description of this feature.

  Ventilator alarm priority can be set to C-1, C-2, or C-3.
  The factory default is C-2.

- **Alarm Latching**

  For a complete description of Alarm Latching, refer to Chapter 7, “Alarms”, in the *Menntor X7 Operation Manual*. The available options are Off, Visual (latching visual alarms only), and On (both visual and audible alarms). The factory default is Off.

- **Alarm Detection Delay**

  When an alarm is detected, a pre-defined delay period allows the system to check in order to avoid false alarms. The delay can be set to 3, 5, 10, 15 or 20 seconds. The factory default is set to 5 seconds.

- **Ventilator Default Color**

  Defines the color in which Anesthetic Agent values appear on the main screen display. You can choose from 16 available colors.

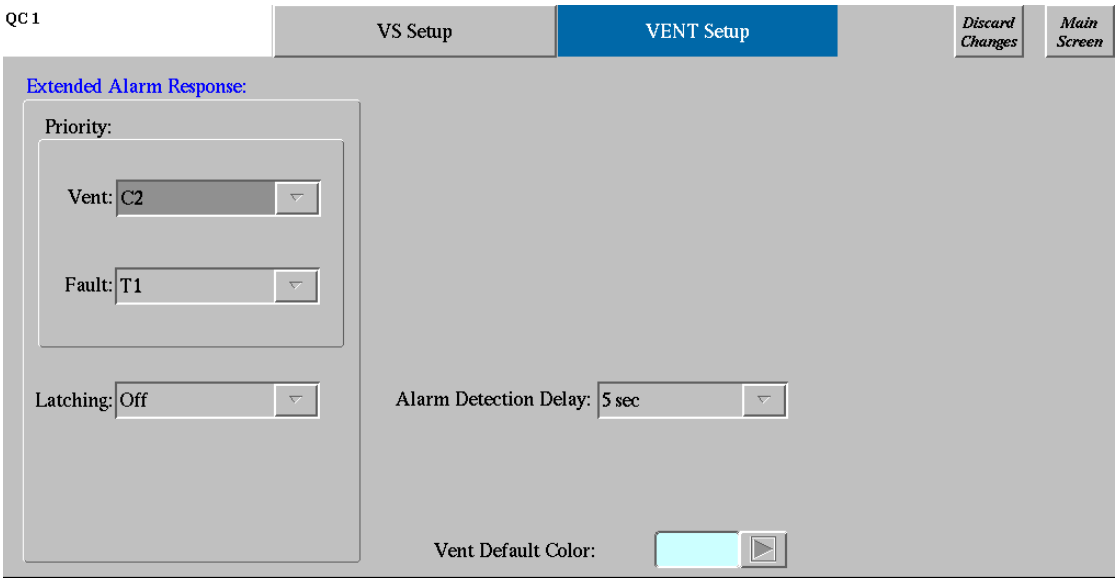


Figure D-23: The Ventilator Dialog Panel

➤ ***To set default Ventilator parameters:***

1. From the **System Setup** menu, select **Vital Signs Setup**. The **Vital Signs** menu is displayed.
2. From the **Vital Signs** menu, select Ventilator **Setup**. The Ventilator **Setup** dialog panel is displayed.
3. Under **Extended Alarm Response**:
   - Set the default priority level for Ventilator alarms.
   - From the **Latching** drop-down list, set default alarm latching to On or Off.
4. From the **Alarm Detection Delay** drop-down list, select the required delay
5. time (in seconds).
6. Select **Ventilator Default Color**. A panel displaying all available
7. colors appears. Select the required color.
8. Select **Discard Changes** to close the panel without applying any changes
   –or–
   Select **Main Screen** to apply the changes and exit the panel.

Note: *When you exit a vital signs setup panel, you return to the main screen. To continue System Setup, you must press the* **System Setup** button again to access the **System Setup** menu.

Parameter Hierarchy

Note:*This dialog panel is active only when a patient is being monitored.*

The Parameter Hierarchy panel enables you to set the waveform and “big number” display on the monitor screen, from top for high hierarchy to bottom for lower hierarchy.

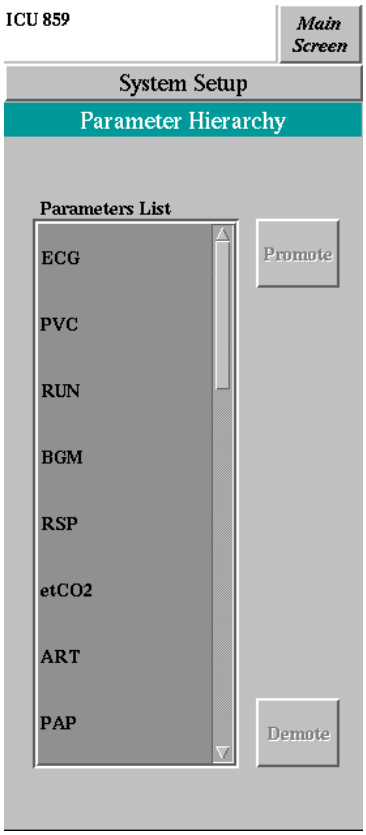


Figure D-24: The Parameter Hierarchy Setup Panel

➤ ***To set the Parameter Hierarchy panel***

1. From the System Setup menu, select Parameter Hierarchy. The Parameters list menu is displayed.
2. From the Parameters list menu, select a parameter.
3. To promote a parameter, select Promote
4. To demote a parameter, select Demote
5. When the required hierarchy is obtained, select main screen

The display will then be reorganized according to the new hierarchy.

Monitor Profiles Setup

When admitting a patient, the admitting staff member must define which vital signs to monitor and how those parameters appear on the main screen display. In order to simplify this process, the monitor can be configured with pre-defined monitor profiles which include all definitions necessary for admitting various types of patients, such as adult, pediatric, geriatric, etc. Monitor profiles make it possible to prepare standard patient monitoring profiles allowing staff to connect a patient quickly without having to first configure the Menntor X7 (or at least to reduce configuration to a minimum).

Up to 12 Monitor profiles can be configured for use in the Menntor X7. This includes 11 user-defined monitor profiles and one default “Admit as previous” key that saves the settings defined for the previous patient monitored by the unit. Only those Monitor profiles defined for use in the unit appear on the display screen.

You can set up Monitor profiles while monitoring an actual patient, or you can start the Menntor X7 without actually connecting a patient, set up monitoring parameters and then save them as a Monitor profile.

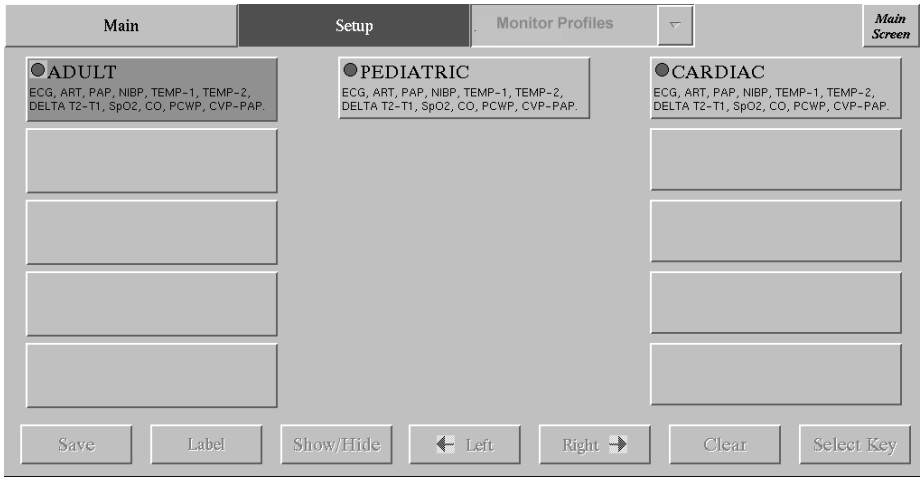


Figure D-25: The Monitor Profiles Setup Dialog Panel

Monitor profiles are defined in the Monitor profiles panel which can be accessed from the Setup menu. The keys are displayed on the panel in the order in which they appear on the Menntor X7 screen when admitting a patient. Any defined Monitor profiles are labeled with their defined name and monitoring parameters.

➤ ***To set up a new Monitor profile:***

1. Set up the monitoring parameters you want according to the instructions in the **Vital Signs Monitoring** section.
2. On the main menu select **Setup** and select **Monitor Profiles** from the **Setup** menu. The Monitor profile panel is displayed.

3. Press **Select Key**.
4. Select an available key. A frame appears around the key and the buttons along.

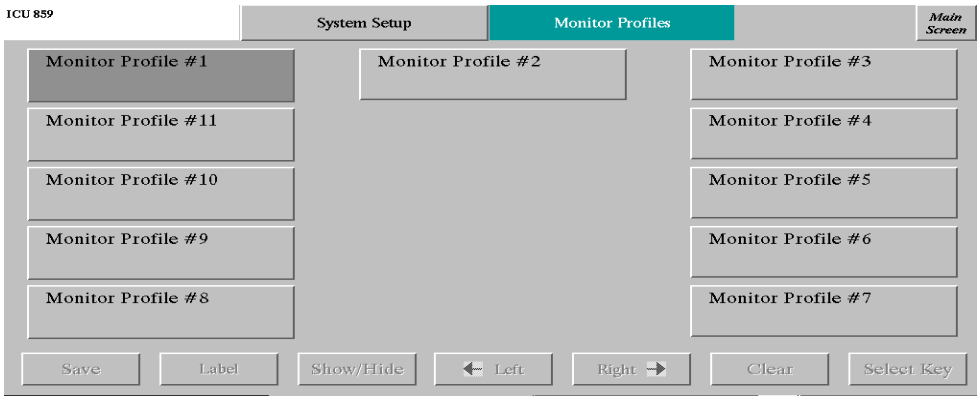


Figure D-26: The Monitor Profiles Selection Setup

➤ ***To set up a new Monitor profile:***

1. Set up the monitoring parameters you want according to the instructions in the Vital Signs Monitoring section.
2. On the main menu select Setup and select Monitor profiles from the Setup menu. The Monitor profile panel is displayed.
3. Press **Select Key.**
4. Select an available key. A frame appears around the key and the buttons along the bottom of the panel become available.
5. Click **Save**.

➤ ***To name a new Monitor profile:***

1. Press **Select Key** in the **Monitor profiles** panel
2. Turn the QuicKnob™ and press an available key
3. Press Label. The alphanumeric keyboard panel appears.
4. Enter the text for the label and press Accept.

Showing/Hiding the Monitor Profile on the Main Screen

Once you have defined a Monitor profile, you can also determine whether it is available for use when admitting a new patient. A green bullet appears next to those Monitor profiles that are set to appear on the main screen.

➤ ***To show or hide the Monitor profile:***

1. In the Monitor profiles panel, press Select Key.

2. Select the required Monitor profile. A frame appears around the key indicating that it is selected.

   • If no bullet appears in the label, press Show/Hide. The green bullet appears and the Monitor profile will appear on the main screen the next time you want to admit a patient.

   • If a green bullet appears in the label, press Show/Hide. The bullet disappears and the Monitor profile is removed from the main screen.

Changing the Position of an Monitor Profile

The Monitor profiles are arranged on the Monitor profile panel in the positions where they will appear on the main screen. You can move the keys to the most convenient position.

➤ ***To move a Monitor profile:***

1. In the Monitor profiles panel, press Select Key.
2. Turn the QuicKnob™ and press the key you want. A frame appears around the key, indicating that it is selected.
3. Press Right to move the selected Monitor profile clockwise

   – or –

   press Left to move the key counterclockwise.

Clearing a Monitor profile

A previously defined Monitor profile may no longer suit your monitoring needs. In that case you can simply clear the Monitor profile from the Menntor X7.

➤ ***To clear a Monitor profile:***

1. In the Monitor profiles panel, press Select Key.
2. Turn the QuicKnob™ until you reach the key you want to clear and press. A frame appears around the selected key.
3. Press Clear. The Monitor profile is removed from the Monitor profiles panel and will no longer appear on the main screen when admitting a patient.

Admit by Default

This panel enables you to admit a patient by a factory set default monitor profile. You can only use this option after the patient has been discharged.

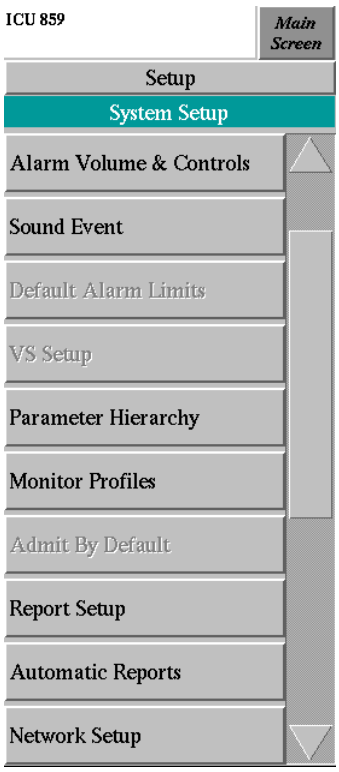


Figure D-27: The Admit by Default Setup Panel

➤ ***To admit by Default:***

1. 1.Discharge the patient
2. 2.Select System Setup
3. 3.From the System Setup menu, select Admit by Default

Report Setup

In order to review patient data, the Menntor X7 generates reports. You can name and define the format for up to 10 types of reports. Reports are configured in the Report Setup dialog panel. All available reports appear in the Reports List. You can configure and edit the format for each report, rename it, and clear the report from the Report List. All reports can be printed and placed in the patient's records.

For example, if you want to set up a report for Hemodynamics, you might first name a report "Hemodynamics" and then, in Edit Report, set up the format for the "Hemodynamics" report. For each report, specify whether the report type is "Charts" or "Trends".

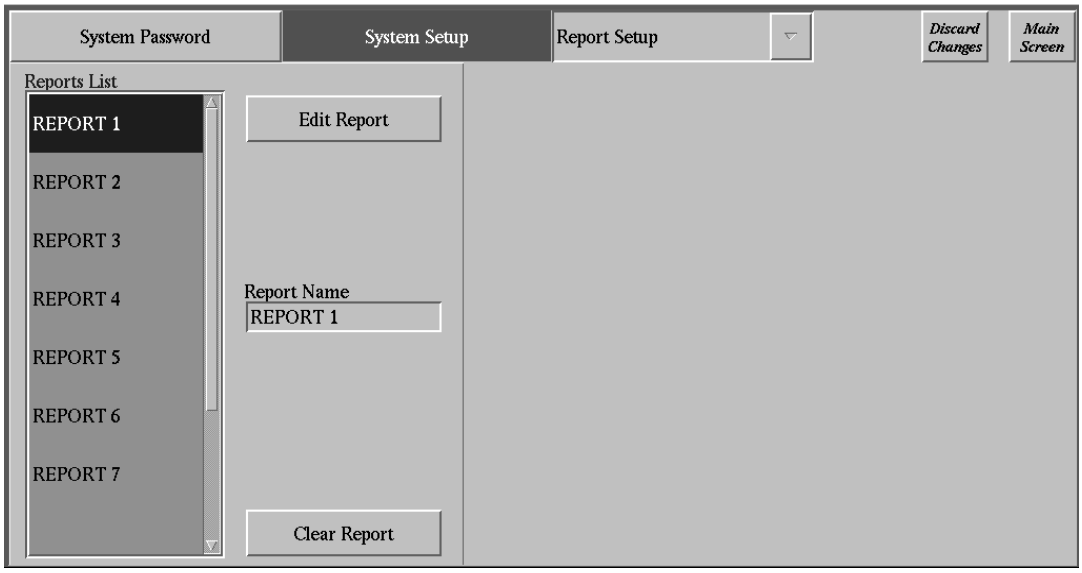


Figure D-28: The Report Setup Dialog Panel

Naming a Report

By default, reports are named Report 1, Report 2, etc. You can change the name of any report according to what is accepted practice in your hospital or department.

➤ ***To rename a report:***

1. In the **System Setup** menu, select **Report Setup**.
2. From the **Reports List**, select a report.
3. Select the **Report Name** textbox. The alphanumeric keyboard panel is displayed. Enter the new report name and close the panel. The new report name now appears on the **Reports List**.

Editing a Report

When you edit a report, you define its type, duration and layout. You can select from one of two report types: **Charts**, or **Trends**.

Charts

A chart documents a patient's condition as observed at regular intervals in table format, much in the same way as a nurse records data in a bedside chart. The Menntor X7 supports the following set of clinical charts for the purpose of data acquisition, clinical calculations and review.

- **Hemodynamics**
- **Respiration**
- **Oxygenation**
- **Renal Clearance**
- **User Defined Charts (with the name as given in Tabular Charts)**

The format of the User Defined chart can be edited. All other charts have a fixed format.

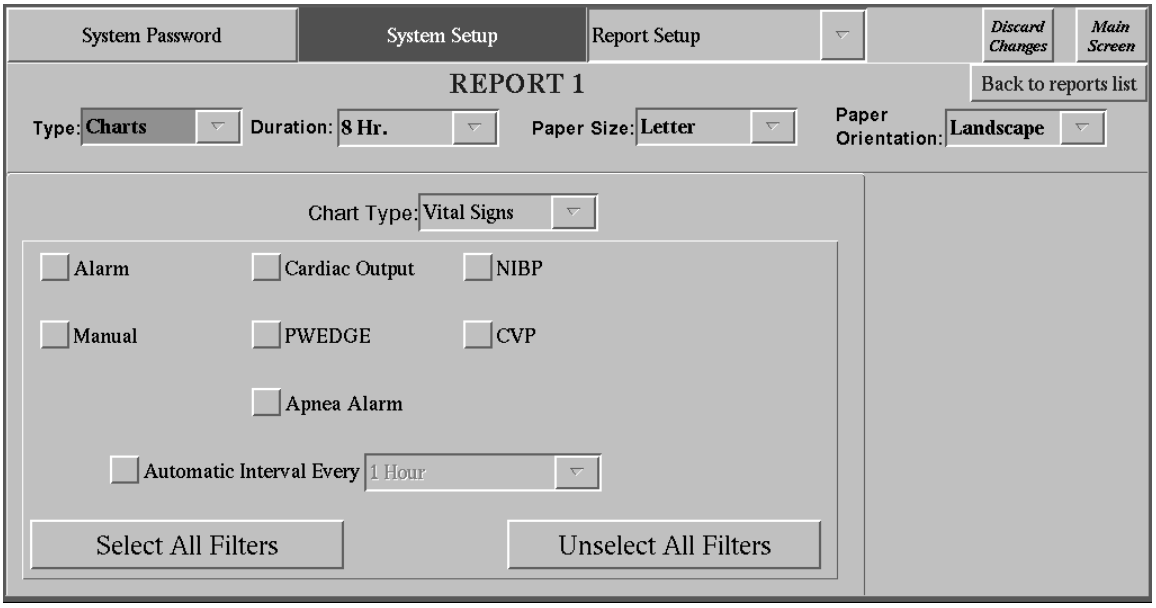


Figure D-29: Setting Up a Chart-Type Report

➤ ***To edit the format of a Vital Signs chart-type report:***

1. From the **System Setup** menu, select **Report Setup**.
2. From the **Report List**, select a report.
3. Select **Edit Report**. The **Edit Report** dialog panel is displayed.

4. In the **Type** drop-down list, select **Chart**.
5. From the **Duration** drop-down list, select the time period during which data is collected for the chart.
6. From the **Paper Size** drop-down list, select the size of the paper you want the report printed out on. Available options are; **Letter**, **Legal**, **Executive**, **A4**, and **A3**.
7. From the **Paper Orientation** drop-down list, select **Portrait** (vertical orientation) or **Landscape** (horizontal orientation).
8. From the **Chart Type** drop-down list, select **Vital Signs**.
9. Press **Select All Filters** for all available filters to be included in the chart
   –or–
   Press **Unselect All Filters** and select only those filters you want to include in the chart. The available filters are; **Alarm**, **Manual**, **Cardiac Output**, **PWedge**, **Apnea Alarm**, **NIBP**, and **CVP**.
10. Select **Discard Changes** to close the panel without applying any changes
    –or–
    select **Main Screen** to apply your changes and return to the blank screen.

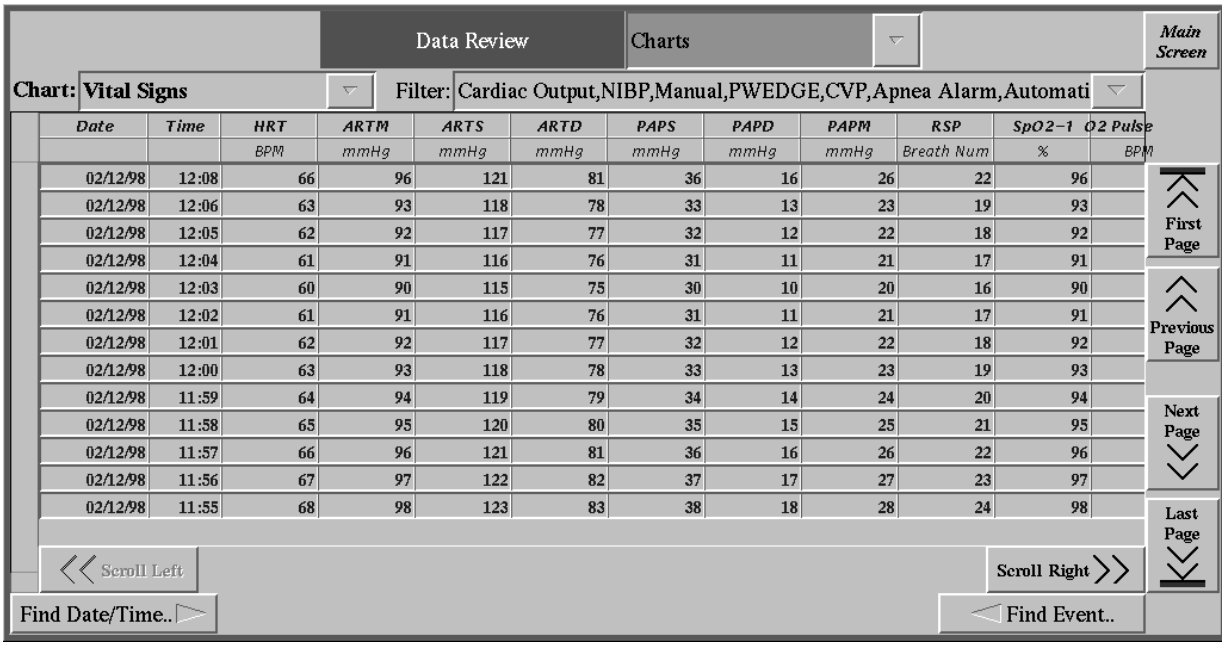


Figure D-30: An Example of a Charts Report Showing All Filters

Trends

Trends allows you to review data in a graphic representation rather than just a list of numbers. Trends represents changes in vital signs over time. Comparing the patterns of change gives an indication of the patient's progress.

For each trend-type report, up to four axes can be presented. Each axis includes a left vital sign parameter and a right vital sign parameter for 8 parameters in total. In the Edit Report panel, you can see a preview of the report as you configure it. Each parameter appearing in the report can be configured to appear in a different color. The available colors are; red, black, green, and blue. Scaling can be configured as fixed or dynamic. You can also define that the data appear on a grid background to make reading the graph easier.

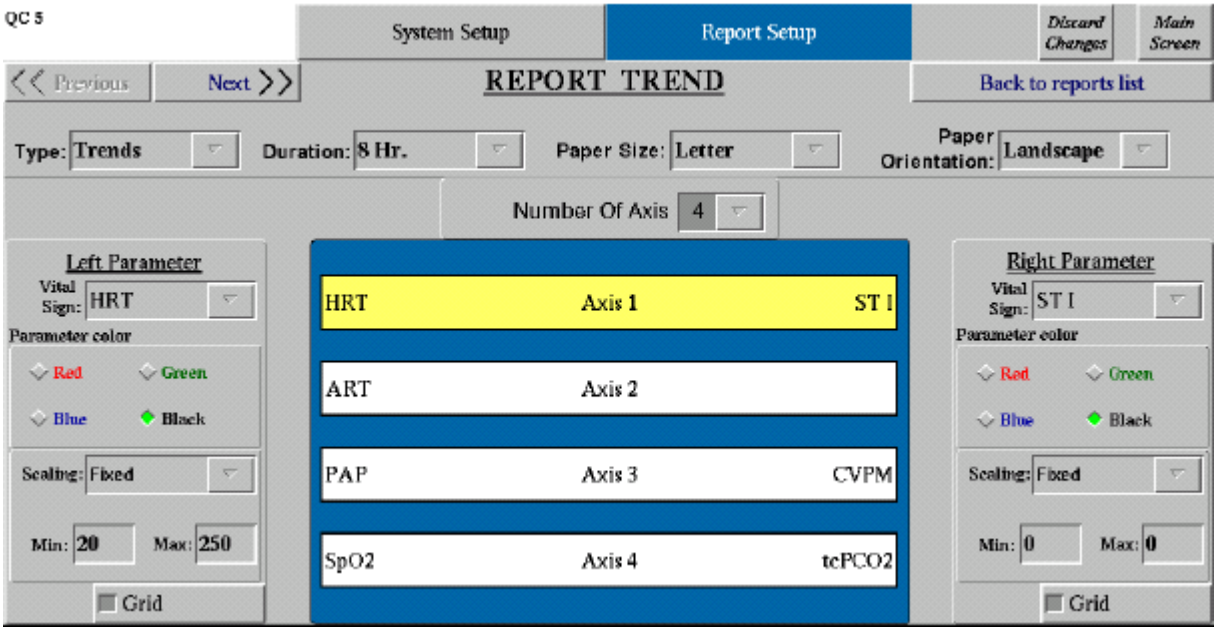


Figure D-31: The Report Setup Dialog Panel Displaying a Trend Report

➤ ***To edit the format of a trends-type report:***

1. From the **System Setup** menu, select Report Setup.
2. From the **Report List**, select a report.
3. Select **Edit Report**. The **Edit Report** dialog panel is displayed.
4. In the **Type** drop-down list, select **Trends**.
5. From the **Duration** drop-down list, select the time period during which data is collected for the chart.

6. From the **Paper Size** drop-down list, select the size of the paper you want the report printed out on. Available options are; **Letter**, **Legal**, **Executive**, **A4**, and **A3**.
7. From the **Paper Orientation** drop-down list, select **Portrait** (vertical orientation) or **Landscape** (horizontal orientation).
8. Select the number of axes to appear in the trend report. Up to eight axes can be presented. Each axis contains a left parameter and a right parameter.
9. Select an axis and define its left and right parameters:
   - From the **Vital Sign** drop-down list, select the vital sign for the left or right parameter.
   - Under **Parameter Color**, select the required color.
   - From the **Scaling** drop-down list, select **Fixed**, or **Dynamic**.
   - When Fixed Scaling is selected, turn the QuicKnob™ and select the min./ max scaling values, as required.
   - Select or clear the **Grid** checkbox to activate or deactivate display of the trended data on a grid.
10. Select **Discard Changes** to close the panel without applying any changes
    –or–
    select **Main Screen** to apply your changes and return to the blank screen.

Clearing a Report From the Reports List

➤ ***To clear a report from the Reports List:***

1. From the **System Setup** menu, select **Report Setup**.
2. From the **Report List**, select the report you want to remove from the list.
3. Press **Clear Report**. The **Report** is removed from the Reports List and the undefined Report# appears in its place.

Automatic Reports

This function is only available if a printer was selected in Network Setup.

This panel enables you to activate the automatic printout of reports at a pre-selected time daily.

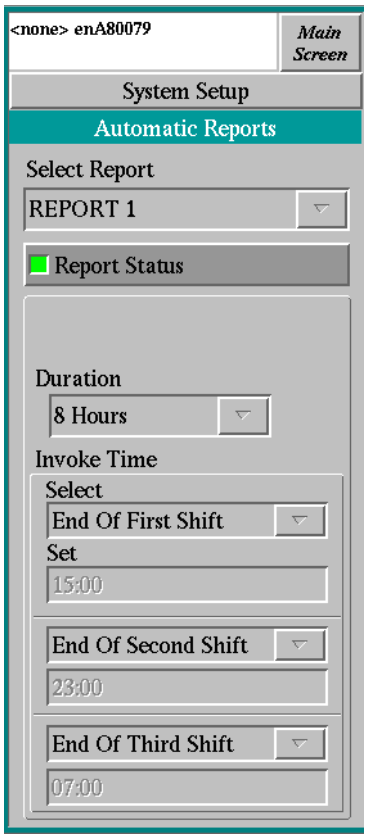


Figure D-32: The Automatic Reports Setup Panel

➤ ***To set Automatic Reports Setup Panel***

1. Select **System Setup**
2. From the **System Setup** menu, select **Automatic Reports**
3. Select the report for automatic printing
4. Activate the **Report Status** toggle (green dot).
5. Select the **Invoke Time** at up to three of the following:
   - End of First/Second/Third Shift.
   - User defined time.
   - Upon Discharge

Note: *Each selected report can be printed automatically up to three times every day.*

Network Setup

The Network Setup panel is used to name a device and to name and define which unit each device is associated with. You can associate a device with each of the units located on the network, or you can create a new unit and assign to it a device.

The panel also displays the device ID number and IP address as defined during manufacturing. If a printer is located on the LAN, you can enable the printer for the device.

If the monitor is connected to a Data Base (D.B.) the panel will show the Data Base Device ID and IP address.

Monitors equipped with Wireless LAN board, can be activated from the **Network Setup** panel. "Wireless Network ID" and "WAP Pass Phase" can be downloaded from the panel to the wireless board. This provides a protected wireless network to Mennen Medical Monitors.

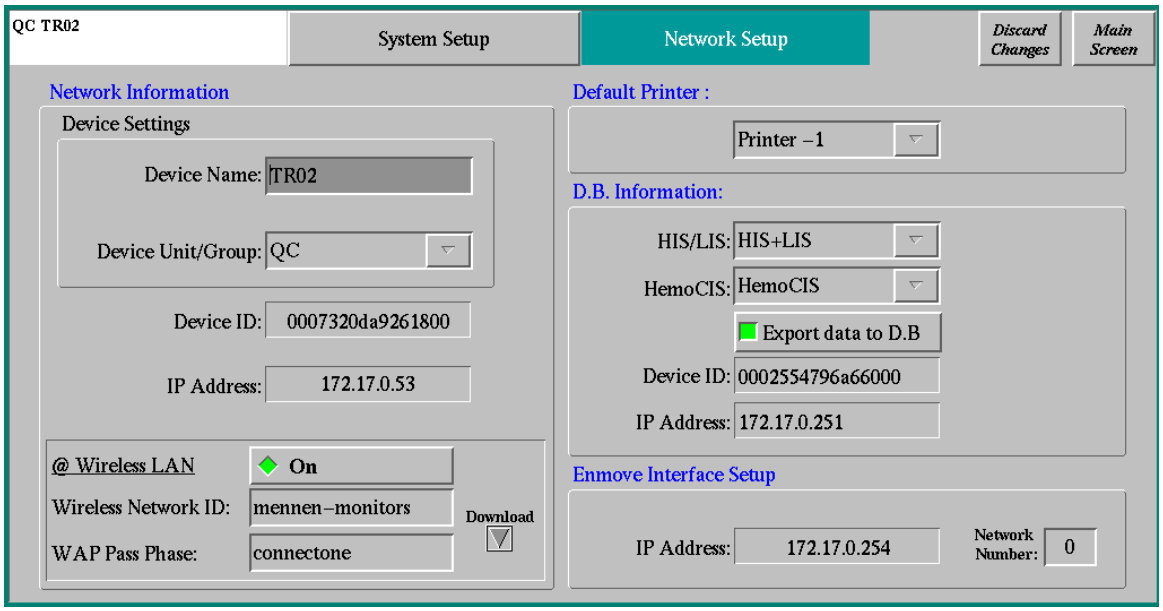


Figure D-33: The Network Setup Dialog Panel

➤ ***To configure Network Setup:***

1. In the **System Setup** menu, click **Network Setup**.
2. Click in the **Device Name** text box and select a device, or enter the name of the device with the alphanumeric keypad.
3. Click in the **Device Unit/Group** text box and select a unit from the list of units located on the network. To create a new unit, select the **Manual** option and using the alphanumeric keypad type the name of the new unit or group.

4. Click the **Printer** checkbox if you wish to use the printer and select the printer to be used.
5. Select Discard Changes to close the panel without applying any changes,
   –or–
   Select Main Screen to apply the changes and close the panel.

IP Address Setup

When a new monitor is connected to the network, it will automatically select a free IP address in the format 117.17.0.XX. You can select to manually set a different IP address.

➤ ***To manually set a fixed IP Address:***

1. Discharge the patient.
2. Enter **System Setup** (Password protected).
3. Select **Network Setup.**
4. Use the QuicKnob™ to set the focus on the IP Address.

This opens a box with a selectable XX number.

5. Press and rotate to get the required manually set IP Address.

A message "System Will Restart" appears.

6. Press **Main Screen** to accept the change and restart the monitor.

Recorder Setup

If the Menntor X7 is connected to a network, it can be set up to send a recording to an in-built (optional) recorder or a defined list of recorders or printers located on the network. The Menntor X7 supports three recording types, each of which can be configured to send recordings to different recorders or printers, as is convenient for the user. These recording types are:

- **Manual Recording**

  A manual recording is initiated by the user at the bedside. The user can select a real-time or delayed recording and can select from the following recording durations: 20, 30, 45, and 60 sec. or Continuous.

- **Alarm Recording**

  A recording triggered by an alarm documenting the ECG waveforms, all VS values and the waveform of the clinical parameter which triggered the alarm (when not ECG). When using a dual channel recorder, the first

channel is always ECG1. For the second channel, you can select ECG2 or any other parameter that produces a waveform.

- **Selective Recording**

  In a selective recording, the user defines which waveforms to record. The following recording durations can be selected: 20, 30, 45, or 60 sec.

Each recording type has its own characteristics. If the Menntor X7 is on a network and a number of different recorders at different locations are available, you can assign specific recorders to specific recording types. For example, manual alarms can be sent to a local recorder located next to the Menntor X7, while alarm and all-waveform recordings can be sent to a Central Nurse Station.

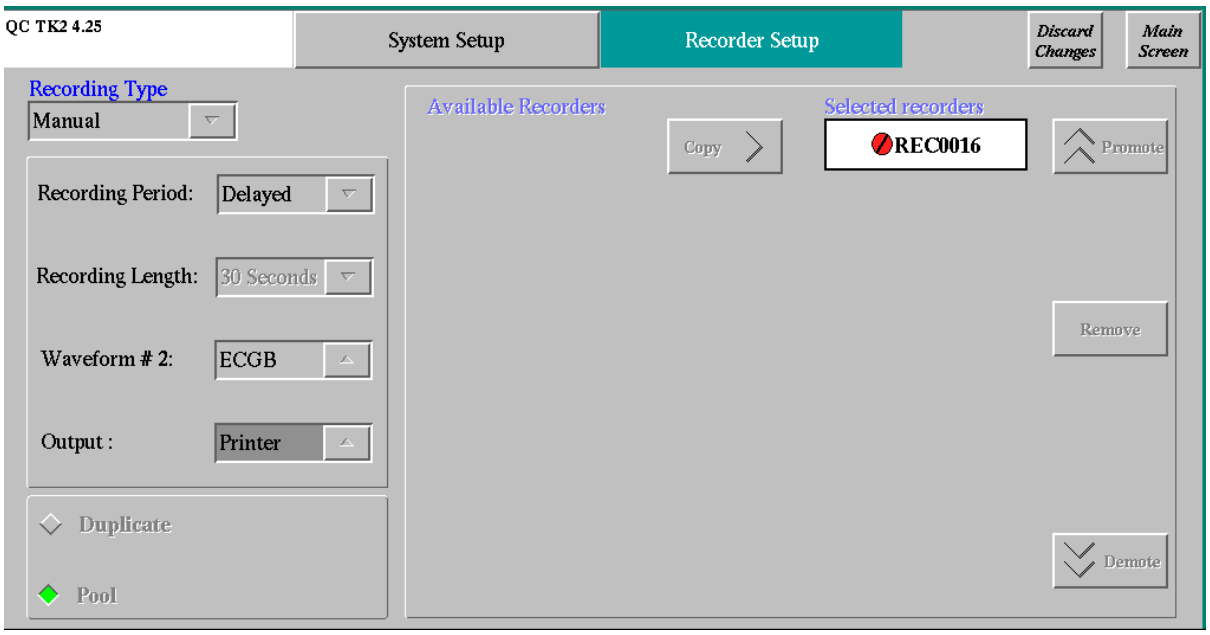


Figure D-34: The Recorder Setup Dialog Panel

Trends Setup

This dialog panel enables you to set the scales to be used in the graphic trend for each vital sign.

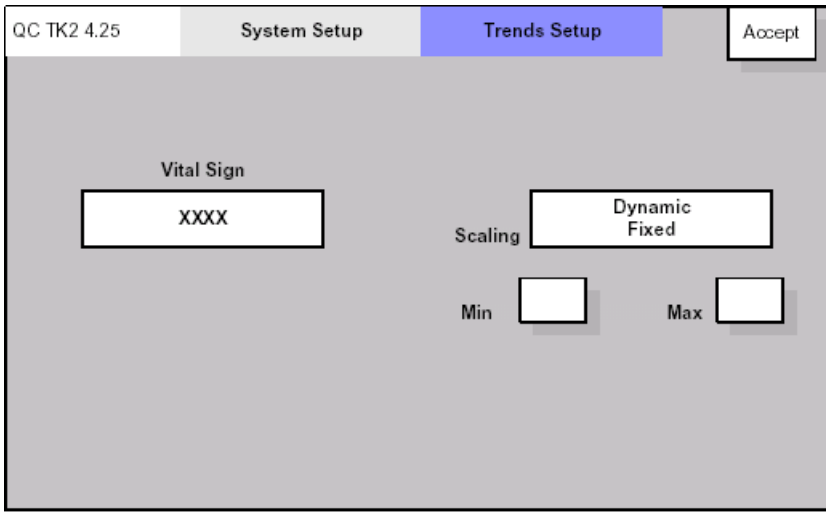


Figure D-35: The Trends Setup Dialog Panel

Two scaling options are available:**Fixed** and **Dynamic**.

If the **Fixed** option is selected, the scales of the Trend graph will be fixed and independent of the input data.

In the **Dynamic** option, the scale of the trend graph will depend on the maximal and minimal parameter values from the patient admission.

➤ ***To modify Trends Setup:***

1. Select Trends Setup from the System Setup menu - a large panel will open.
2. On the left of the panel open the "Vital Sign" window - a list of vital signs appears.
3. Select a parameter - for example RSP.
4. In the Scaling window select either "**Fixed**" or "**Dynamic**"
5. If you select **Fixed**, set the Min (minimum) and the Max (maximum) limits of the trend scale.
6. If you select "**Dynamic**" the Min and Max values will be dimmed and will show the maximal and minimal limits of the dynamic scaling.
7. Click on Accept to accept the selected settings.

QuicKeys™ Setup

Note:*This dialog panel is active only when a patient is being monitored.*

The QuicKeys™ bar is a row of up to 12 user-defined function keys that appear on the bottom of the main screen display.

This panel provides you with quick access to your most frequently used functions and menus. For example, if you want to access the Charts panel, instead of pressing the Data Review fixed key on the front panel and then selecting Charts from the Data Review menu, you can simply turn the QuicKnob™ until the Charts QuicKey™ is highlighted and press to display the Charts panel. Any function can be configured as a QuicKey™. QuicKeys™ are configured by your hospital biomedical engineer or System Administrator in System Configuration.

Note: QuicKeys™ disappear from the screen every two minutes.
To redisplay the QuicKeys™, simply turn the QuicKnob™.

Figure D-36: The QuicKeys™ Bar.

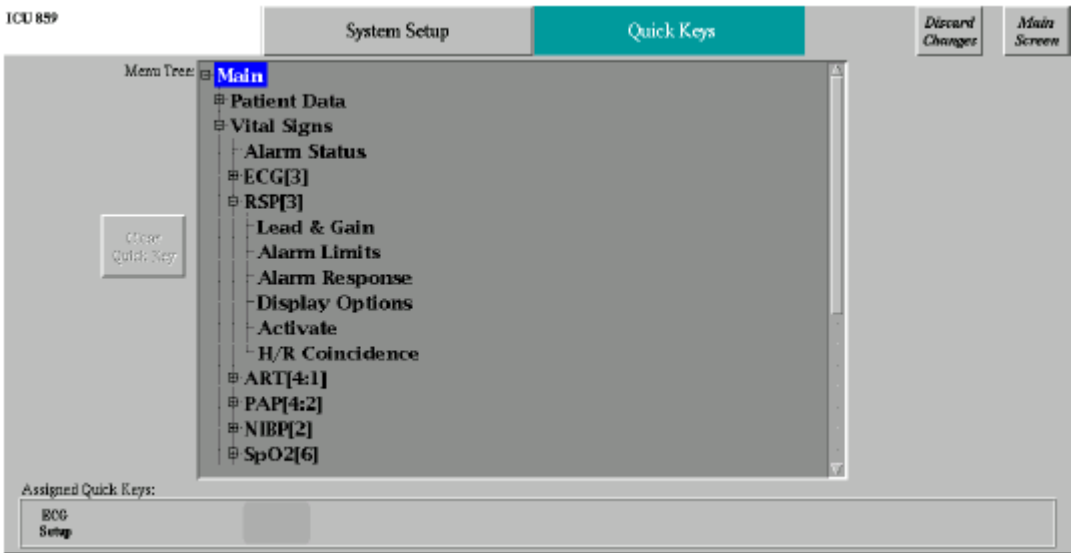


Figure D-37: The QuicKeys™ Setup Panel

➤ ***To assign a QuicKey™***

1. Select System Setup
2. From the System Setup menu, select QuicKeys™

3. Use the QuicKnob™ to select one of the QuicKeys™ – this opens a menu with a green background
4. Press and rotate the QuicKnob™ to open the menu item and open the sub menus
5. Select the function that you wish to assign – press the QuicKnob™ to finish the assignment.

Tabular Charts

A chart documents a patient's condition as observed at regular intervals in table format, much in the same way as a nurse records data in a bedside chart. The Menntor X7 supports a set of clinical charts for the purpose of data acquisition, clinical calculations and review (For more details, see "Report Setup" on page D-58)

The Menntor X7 also enables to create **User Defined Charts** (UDF), customized to specific needs of a unit or patient. This is done in the Tabular Charts panel. Up to 10 User Defined charts can be defined in System Setup. You can define the parameters that appear in the UDC, edit the format of a UDC, rename it, and clear a UDC from the User Defined Charts List. All UDCs can be printed and placed in the patient's records.

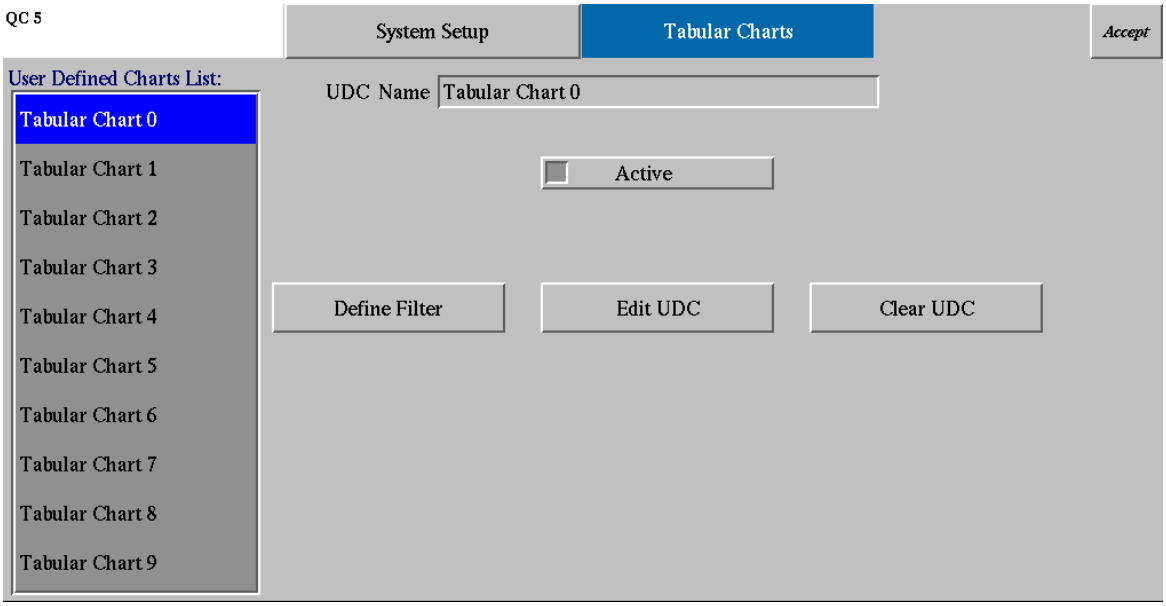


Figure D-38: The Tabular Charts Dialog Panel

5.17.1Naming a UDC

By default, User Defined Charts are named Tabular Chart 1, Tabular Chart 2, etc. You can change the name of any tabular chart according to what is accepted practice in your hospital or department.

➤ ***To rename a Tabular chart:***

1. In the **System Setup** menu, select **Tabular Charts**. The **Tabular Charts** panel opens.
2. From the **User Defined Charts List**, select a tabular chart.
3. Select the **UDC Name** textbox. The alphanumeric keyboard panel is displayed. Enter the new UDC name and close the panel. The new chart name now appears in the **User Defined Charts List**.

5.17.2Editing a UDC

Editing a User Defined Chart includes the following procedures:

- Defining the parameters to appear in the chart. The parameters can be selected from any of the available parameters associated with the Menntor X7 predefined charts.
- Defining the order in which the parameters will appear in the chart.
- Defining an alarm column for display of clinical alarms for the selected parameters.
- Defining filters – the conditions according to which entries are added to the chart. The available filters are:
  - Manual - Chart entries based on a manually selected event.
  - Alarm - Chart entries when an alarm is triggered.
  - Cardiac Output - A chart entry each time a cardiac output reading occurs.
  - PCWP - A chart entry each time a pulmonary wedge reading occurs.
  - NIBP - A chart entry each time a NIBP reading occurs.
  - CVP - A chart entry each time a VCP reading from the PAP channel occurs.
  - Apnea - A chart entry each time an apnea event occurs.
  - Time Interval - Chart entries based on a defined time interval.

➤ ***To edit a User Defined Chart:***

1. From the **System Setup** menu, select **Tabular Charts**. The **Tabular Charts** panel opens.

2. From the **User Defined Charts List**, select a chart and click the **Edit UDC** button. An editing dialog panel appears, displaying all available charts supported by the Menntor X7, and the parameters associated with each.

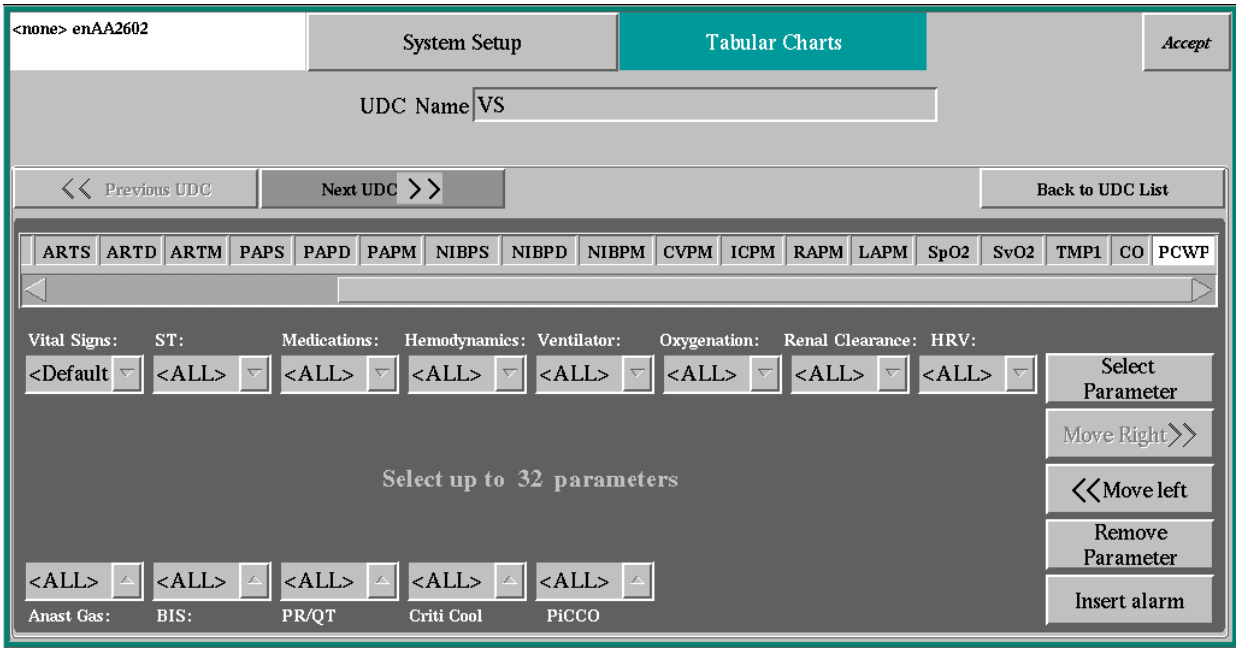


Figure D-39: Editing a Tabular Chart

3. Click the arrow beneath a category (chart name), and from the list of parameters available for the category select the required parameters for the UDC. The selected parameters appear on the bar above.
4. To define the order of parameters in the UDC, click on a selected parameter and then click the **Move left** or **Move right** buttons until the parameter reach the required location. If you want to remove any of the selected parameters, select the parameter and click **Remove Parameter**.
5. To display alarms, click the **Insert alarm** button.
6. Click **Accept** to apply your changes and return to the **Tabular Charts** panel.

Note: *If you want to return to the **Tabular Charts** panel without applying any changes, click **Back to UDC List**.*
*If you want to move to the next or to the previous UDC in the list, click **Next UDC** or **Previous UDC** accordingly.*

7. To set filters, in the **Tabular Charts** panel click the **Define Filter** button. A window opens displaying all available filters.

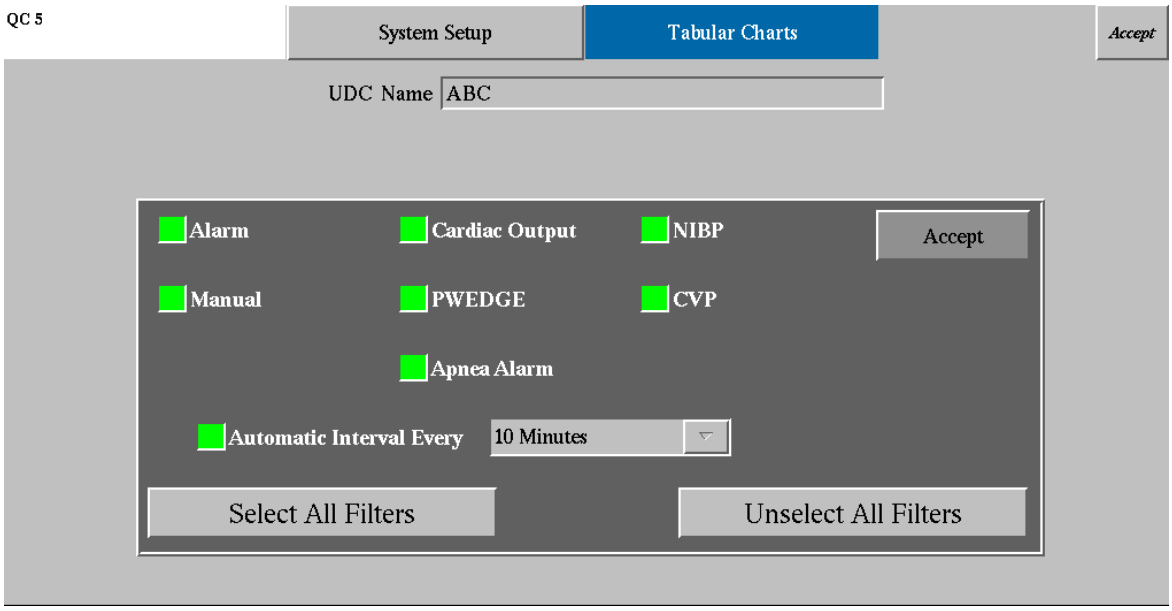


Figure D-40: Defining the Filters

8. Press **Select All Filters** for all available filters to be included in the chart
   –or–
   Press **Unselect All Filters** and select only those filters you want to include in the chart.
9. Click **Accept** to apply the changes and return to the **Tabular Charts** panel. The new UDC appears in the **User Defined Charts** list.

Clearing a UDC From the UDC List

➤ ***To clear a UDC from the UDC List:***

1. From the System Setup menu, select Tabular Charts.
2. From the **User Defined Charts List**, select the UDC you want to remove from the list.
3. Press **Clear UDC**. The **UDC** is removed from the User Defined Charts List and the undefined Tabular Chart# appears in its place.

Updating the Software Version

The Software Version panel displays the software version of the bedside monitor,the MPM BEP, and CIPAM, the two plug-in modules and modules connected via the UIM. It also allows you to download the software for the modules.

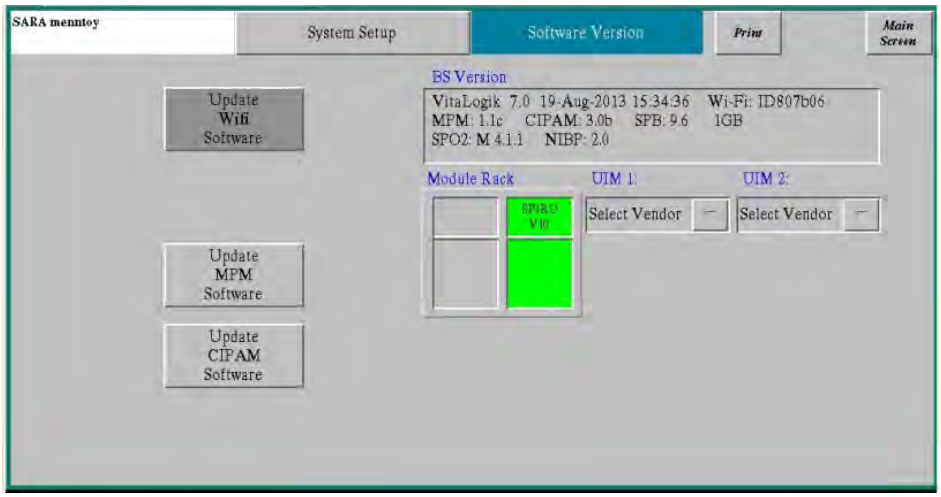


Figure D-41: The Software Version Panel

➤ ***To download BEP software:***

1.Click the **Update BEP Software** button. A window with a list box containing software versions appears.

2. Select the new version to update.

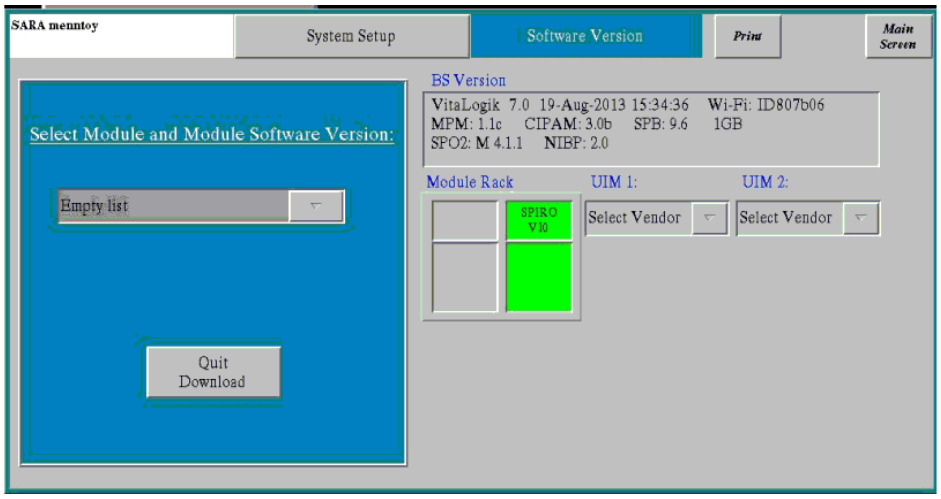


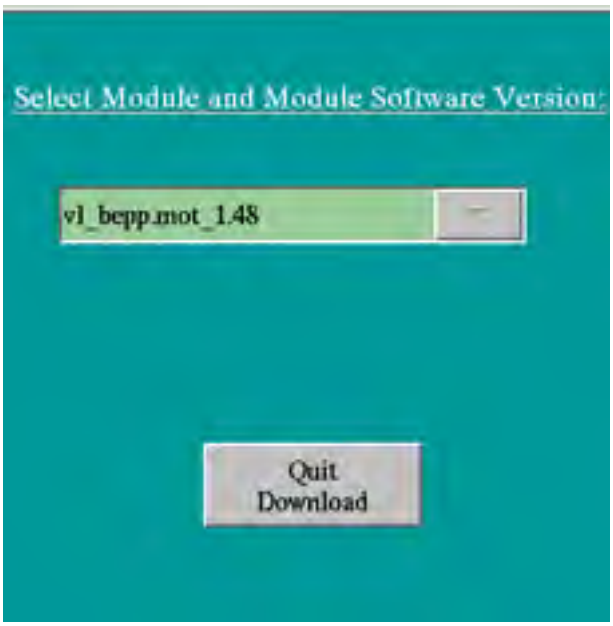
Figure D-42: Selecting the Software Version

4. Click the **Update CIPAM Software** button. A window with a list box containing software versions appears.
5. Select the new version and update.
6. Press the QuicKnob™. A message appears, requesting you to confirm the upgrade of the software.
7. Click **Yes** to download the software.

8. Click **Main Screen** to close the panel.

➤ ***To download UIM vendor software:***

1. In the UIM box, select the vendor; a window with a list box containing software versions appears.



2. Select the new version and update.
3. Press the QuicKnob™; a message appears, requesting you to confirm the upgrade of the software.
4. Click **Yes** to download the software.
5. Select **Main Scree**n to close the panel.

➤ ***To download plug-in module software:***

1. In the module box, select the module; a window with a list box containing software versions appears.
2. Select the new version and update.
3. Press the QuicKnob™; a message appears, requesting you to confirm the upgrade of the software.
4. Click **Yes** to download the software.
5. Click **Main Screen** to close the panel.

➤ ***To download MPM software:***

1. Click Update MPM version; a window with a list box containing software versions appears.
2. Select the new MPM SW version and Update.
3. Press the QuicKnob™; a message appears, requesting you to confirm the upgrade of the software.
4. Click **Yes** to download the software.
5. Click **Main Screen** to close the panel.

Enmove™ Interface Setup

To use the Menntor X7 with the Ensemble EN Central Station,the monitor has to receive a “Network Number”in the common network of Enmoves and Menntor X7s, To set the “Network Number”enter:**System Setup > Enmove Interface Setup** and give the monitor a “**Network Number**”between 1 and 64.

The “Network Number”is displayed in **System Setup >Network Setup** under the heading:**Menntor X7 to MCS interface**.

CAUTION! *Each of the monitors Menntor X7’s and Enmove’s must have a different Network Number.*

Note:*All Menntor X7 monitor with software version 3.6 and up can be monitors on Ensemble EN Central Nurse Station*

Change Password

The Change Password option allows you to change the password that enables access to the System Setup menu. Access to the System Setup menu is limited to authorized personnel, such as a System Administrator or Hospital Biomedical Engineer.

➤ ***To change the password:***

1. In the **System Setup** menu, click **Change Password**. The **Change Password** panel opens.

Figure D-43: Changing the Password

2. Enter the new password (3 digits) and click **Accept**.
3. A panel appears requesting you to type the password again. Type the password again and click **Accept**.

Check Disk

When running Check Disk, all patient information on the disk is erased.

Warning! Avoid using this option.

➤ ***To run Check Disk:***

- In the **System Setup** menu, select **Check Disk**.

Permission Editor

In the Permission Editor panel you can define which Menntor X7 functions are available. By default, access to all functions is available. However, you can configure certain functions to be unavailable. For example, you can decide that at a certain station recording of vital signs data cannot be performed. The Permission Editor displays the entire Menntor X7 menu in tree format, and allows you to define, for each menu option, whether it is available or unavailable for the current Menntor X7.

The following modes can be set for each menu option:

- **On** - select this checkbox to activate the menu option. The option appears in the appropriate panel and can be accessed.
- **Off** - select this checkbox to remove the menu option from the appropriate panel. The option cannot be accessed.
- **Dimmed** - select this checkbox when you want the menu option to appear dimmed on the panel. The option cannot be accessed.

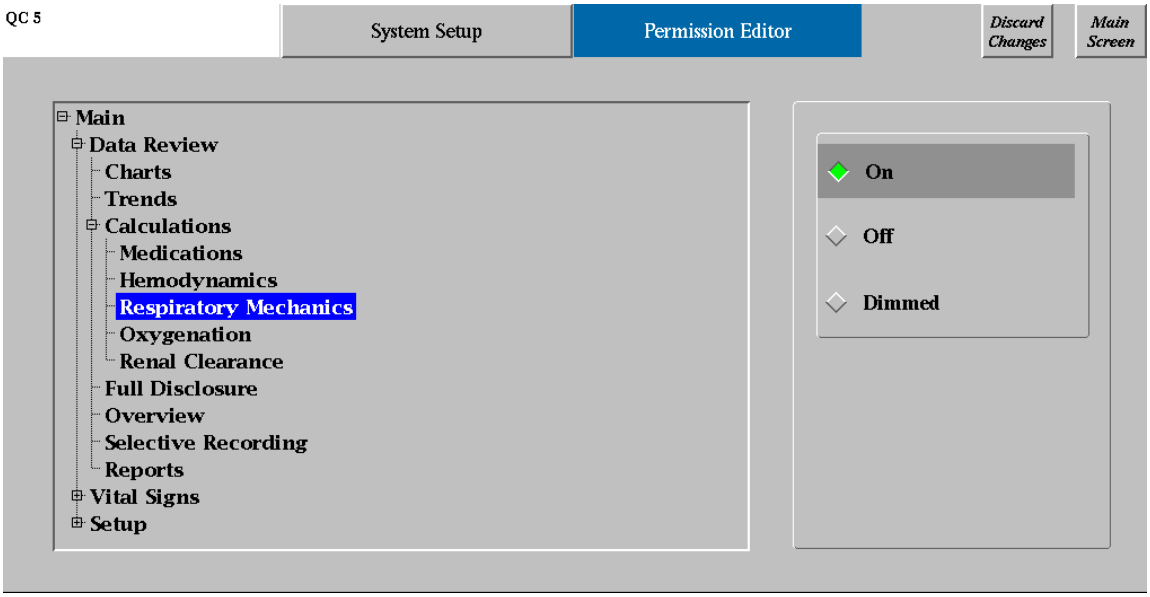


Figure D-44: The Permission Editor Panel

➤ ***To define permission for a menu option:***

1. From the **System Setup** menu, select **Permission Editor**. The **Permission Editor** panel appears displaying a menu tree with all Menntor X7 menu options.

2. In the menu tree, click the plus (+) icon that appears to the left of a menu item to access the menu level below that listed on the screen. Any item from any level can be selected when assigning permission.
3. Select the required menu item, and then select the permission status for the item.
4. Repeat step 3 until defining permission for all the menu option that you want.
5. Click **Main Screen** to apply changes and close the panel.

Remove Saved Patients

Use this panel to view the list of patients with data saved in the Menntor X7 monitor.

➤ ***To delete a patient from the list***

1. Select the patient row - this opens a list of the following options:
   - Delete - to delete the patient from the list
   - Sort the list, or
   - Close

Note: *The data of a patient that is deleted from the list is LOST and cannot be retrieved.*

Touch Screen Calibration

Select the Touch Screen Calibration item. A blank screen will appear. Follow the instruction and touch the screen corners. At the end of calibration press Main Screen.

Demo Activation

The Menntor X7 monitor has a Demo Mode where signals stores in the system can be viewed and almost all features of the monitor can be demonstrated.

The following vital signs data will be used in Demo Mode:

- 12 lead ECG, 80 Bpm, ST (-2.0) - (1.5), Filter = ST
- Respiration RA-LL 19 BPM,
- ART, PAP, waveforms and vital signs
- SpO2 96%, Pulse 70 - 76
- EtCO2, 0 to 5% (0 to 39 mmHg), Respiration 17 BPM

- Temp: Temp1 - 35 C, Temp2 - 31.2C, Temp3 - 36.8C, Temp4 - 37.0 C, Temp3-
- Temp4 - 0.2C

Not Available: Cardiac Output, NIBP, Arrhythmia

Patient Clinical Data (Waveforms, Vital Signs, Bit-to-Bit & QRS) source will be two minutes of recorded signals data played in a continuous loop.

➤ ***To start Demo Mode***

1. Discharge the patient.
2. Enter System Setup.
3. Select Demo Mode from System setup menu.
4. Enter password 517.
5. Admit a patient
6. Monitor goes into Demo Mode.

➤ ***To exit Demo Mode***

- Discharge

Copy Configuration Utility

The Copy Configuration utility enables transferring monitor configurations from one Menntor X7 monitor to other Menntor X7 monitors on the same network.

CAUTION! *You can transfer configurations between monitors only when they are of the same software version.*

CAUTION! *You can only transfer configurations between monitors which are the same model (Menntor X7 to Menntor X7, not from Menntor X7 to Envoy or to VitaLogik or vice versa).*

Copying a configuration includes the following steps:

1. Building a reference monitor configuration
2. Storing the configuration on the reference monitor
3. Copying the configuration to each monitor you want to copy the configuration to.

➤ ***To build the reference monitor configuration:***

1. Admit a patient without inserting a name or any demographic information.
2. Set the monitoring profiles, the alarm limits and display options.

3. Discharge the patient.

➤ ***To store the configuration on the reference monitor:***

1. Enter System Setup.
1. Select Build Master Configuration from System Setup menu.

The monitor will restart and store the configuration files

➤ ***To copy the configuration to a monitor:***

1. On Main menu select > Setup ' A - D - T ' > Discharge Patient
2. On Main menu select > Setup > System Setup > Copy Configuration from.
3. Choose the source (reference) monitor's unit.
4. Choose the source (reference) monitor from the list.

“Are you Sure" panel will appear.

5. Select "Copy"

The monitor will restart and will come up with the new configuration.

6. Verify that all the changes including the new profiles, permissions, QuicKeys™ are displayed.

CAUTION! *If Alarm Watch was part of the configuration, be sure to remove the target monitor watching itself and if required to add the reference monitor to the watched monitors list.*

Example :

The reference monitor was BED 1, and it was watching BED 2

Upon transfer BED 2 is part of the list of beds watched by BED 2 which means that BED 2 watches itself, while BED 1 is not watched by BED 2.

You need to remove BED 2 from the list of beds watched by BED 2, and to add BED 1 to the watched bed list.

Note: *If Enmove interface is used, enter "Enmove Interface Setup" panel of each of the target monitors and set it to the proper Enmove network number.*

APPENDIX E:
SETTING UP THE INTERFACE BETWEEN VIGILEO AND MENNTOR X7

The interface between Vigileo and Menntor X7 supports the transfer of the following parameters to the Vital Signs chart: CO and SvO2 .

The following parameters are not transferred : CI, SV, SVI, SVR, SVV, SVRI

➤ ***To set up the serial port on Vigileo to interface with Menntor X7:***

1. Select the Status box (lower-left).
2. Select **Serial Port Setup.**
3. Enter the following:
   - **Device** : IF Mout
   - **Baud Rate**: 19200
   - **Parity**: None
   - **Stop Bit**: 1
   - **Data Bit** : 8
   - **Flow Control** : 2 Sec
4. Press **Return.**

➤ ***To enter Demo Mode:***

1. Select the Status box (lower-left)
2. Select **Display Setup**.
3. Turn Demo mode to **Enable**.
4. Enter Patient data.
5. Select: **CO**.
6. Select: **Zero Arterial Pressure.**
7. Wait several minutes.

Demo mode starts.

➤ ***To enter Engineering mode:***

1. Select the Status box (lower-left)
2. Enter **Password** : 8888

Engineering mode starts.

APPENDIX F:
TEST PROCEDURE

Serial Number : _____ Unit P/N: _____

Tested By: _____ Date: _____

Table 1:

Par.	Subject	Description	Specifications	Measured value	Result: Pass/ Fail
1.	Visual Inspection.	UUT without Cover- Check all connectors, Cables, screws, Dust	O.K.		
Connect the UUT to the main power and to display only (the cover is open).					
2.	**Main power, Fans, Batteries Leakage, Mounting- testing**				
2.1	Connect main power cable & Battery Press main power switch for 1sec	AC led in Green	O.K.		
		Charger Led is Green Blinking / Permanent.	O.K.		
		System is stating to be loaded	O.K.		
		Led on main switch is on	O.K.		
2.2	Disconnect the AC line	Charger Led is Red AC led is off System is running	O.K.		
			O.K.		
			O.K.		

Table 1:

Par.	Subject	Description	Specifications	Measured value	Result: Pass/ Fail
2.3	Connect AC line	AC led in Green Charger Led is Green Blinking / Permanent.	O.K.		
			O.K.		
2.4	Main Battery	3 Years Passed? Yes – Replace Battery	Done		
2.5	Fan on CPU Board	3 Years Passed? Yes – Replace Fan	Done		
		Working, low noise and air direction to out	O.K.		
2.6	CPU Battery	3 Years Passed? Yes – Replace Battery	Done		
2.7	Fan on the chassis	4 Years Passed? Yes – Replace Fan	Done		
		Working, low noise and air direction to out	O.K.		
2.8	Leakage	As per standard	pass	Add Report	
2.9	Mounting	Check the Mounting	O.K.		
3.	**Trim Knob, Leds, Esc. Switch, Touch Screen, Configuration**				
3.1	3 Years passed?	Replace switch	Done		
	Trim Knob test	Move the Knob and see functions on screen	O.K.		
3.2	Esc key test	Chose ecg and esc to main screen	O.K.		
3.3	NIBP key test	Active NIBP press NIBP Verify that the pump start	O.K.		
3.4	Silence key test	Press and verify label on the screen	O.K.		
3.5	Print key test	Press and verify that screen Is flashing	O.K.		
3.6	Touch Screen-(option)	Press on the touch screen and verify function	O.K.		
3.7	Set configuration	Record the configuration to the Laptop	Saved		
4.	**Software Version**				
4.1	Main Unit Software	Software Version	V_____		

Table 1:

Par.	Subject	Description	Specifications	Measured value	Result: Pass/ Fail
4.2	CIPAM FE FLASH S.W.	Software Version	V_____		
4.3	BEP FLASH S.W.	Software Version	V_____		
4.4	SPO2 S.W. Version	Software Version	V_____		
4.5	NIBP S.W. Version	Software Version	V_____		
4.6	EtCO2 S.W. Version	Software Version	V_____		
4.7	BIOS S.W. Version	Software Version Mennen Default	V_____		
4.8	SPB S.W Version	Software Version	V_____		
5.9	Wireless Version	Software Version	V_____		
6.	**ECG Test , Simulator - DNI217A or similar**				
6.1	Without ECG cable	“cable Out" message on the screen	O.K.		
6.3	Connect 5/12 leads cable without leads wires	" Fault ALL" message	O.K.		
		Verify 5/12 Lead detection at ECG WF panel	O.K.		
6.4	Insert 5/12 leads cable. Connect all leads wires to the simulator 120BPM	Verify that fault message disappear	O.K.		
		Heart Rate 120BPM	120+/- 2bpm		
6.5	**Alarm Test (Speaker and keys test)**				
6.5.1	QRS Tone test	Set the volume			
6.5.2	Alarm Tone test	Set the volume and ecg out of the limit			
6.5.3	Silence key test (press Silence again after test for next step)	Press Silence key (the red label remained)			
6.5.4	Alarm LED test – (RED) Set alarm to C1 and make alarm	Upper red led should blink			

Table 1:

Par.	Subject	Description	Specifications	Measured value	Result: Pass/ Fail
6.5.5	Alarm LED test – (Yellow) Set alarm to C2 and make alarm	Upper yellow led should blink			
6.6	**ECG Leads Faults test , Disconnect only one on each cycle**				
	LEAD RL	“Lead RL Fault” Message	O.K.		
	LEAD RA	“Lead RA Fault” Message	O.K.		
	LEAD LA	“Lead LA Fault” Message	O.K.		
	LEAD LL	“Lead LL Fault” Message	O.K.		
	LEAD V 1	“Lead V Fault” Message	O.K.		
	LEAD V 2	“Lead V2 Fault” Message	O.K.		
	LEAD V 3	“Lead V3 Fault” Message	O.K.		
	LEAD V 4	“Lead V4 Fault” Message	O.K.		
	LEAD V 5	“Lead V5 Fault” Message	O.K.		
	LEAD V 6	“Lead V6 Fault” Message	O.K.		
7.	**Respiration Test -Set the simulator DNI217A to 1000 ohm RL-LL V.L.= RA-LL**				
7.1	3 Ohms 20bpm	Value	20 BPM ± 2		
		Waveform without noise	O.K.		
8.	**IBP Test , Simulator-DNI217A and TP400** ***the main board should be calibrated, According to the BP Calibration procedure***				
8.1	**IBP-1**				
8.1.1	Disconnect the BP1 extension cable	“Cable out” Message	O.K.		
8.1.2	Connect BP1 extension cable	“Xducer not detect” Mes-sage	O.K.		
8.1.3	Connect simulator	“Not Zero” Message	O.K.		
8.1.4	Zero BP-1	BP-1 on the display	0/0/0 +/- 2mmHg		
8.1.5	BP1-200mmHg in	BP-1 Rate	200/200/200 +/- 2mmHg		

Table 1:

Par.	Subject	Description	Specifications	Measured value	Result: Pass/ Fail
9.2	**IBP-2/3/4 – Repeat for IBP3/4 if required**				
9.2.1	Disconnect the BP2/BP3/BP4 extension cable	"Cable out" Message	O.K.		
			O.K.		
			O.K.		
9.2.2	Connect BP2/BP3/BP4 extension cable	"Xducer not detect" Message	O.K.		
			O.K.		
			O.K.		
9.2.3	Connect simulator	"Not Zero" Message	O.K.		
			O.K.		
			O.K.		
9.2.4	Zero BP-2/BP-3/ BP-4 by the key	BP-2/3/4/ on the display	0/0/0 +/- 2mmHg		
9.2.5	BP2/BP3/BP4 +200mmHg in	BP-2/3/4 Rate	200/200/200 +/- 2mmHg		
			200/200/200 +/- 2mmHg		
			200/200/200 +/- 2mmHg		
10.	**Cardiac Output Test - Simulator: DNI217A and DNI21A or similar**				
10.1	Disconnect CO Cable	"Cable out" Message	O.K.		
10.2	Connect CO 2 Temp Split cable	Temp-3/4 = 30	T3 = 30 +/- 0.1 T4 = 30 +/- 0.1		
		Temp-3/4 = 37	T3 = 37 +/- 0.1 T4 = 37 +/- 0.1		
11.	**TEMP Test - TEMP Simulator, model FOGG TP69, or similar**				
11.1	Temp-1/2	Temp-1/2 = 30	T1 = 30 +/- 0.1		
			T2 = 30 +/- 0.1		
11.2	Disconnect T1	"T1 Probe out " Message	O.K.		

Table 1:

Par.	Subject	Description	Specifications	Measured value	Result: Pass/ Fail
11.3	Disconnect T2	"T2 Probe out " Message	O.K.		
12.	SpO2 Test				
12.1	Spo2 without adapter cable	“Cable out” Message	O.K.		
12.2	Connect adapter without the sensor	“Probe out” Message	O.K.		
12.3	Connect the sensor to the finger	Waveform	O.K.		
		SPO2 Value	XXX -Person test (90-100)		
12.4	Recheck Spo2- Disconnect cable and connect again	SPO2 Value & W.F	O.K.		
13.	NIBP Test (if replacing OEM Module add the CAS NIBP test results)				
13.1	Warp the cuff on the hand	NIBP SYS	XXX -Person		
		NIBP DIAS	XXX -Person		
		NIBP MEAN	XXX -Person		
14.	EtCO2 Test				
14.1	One Year Passed	YES- Need Calibration	Done		
14.2	EtCO2 without tube	Tube not connected message should be displayed	O.K.		
14.3	Connect tube and test the Waveform	Waveform	O.K.		
15.	**Recorder- Built in. Test**				
15.1	Open Recorder door. In Utilities Activate Record button.	Verify 1. Recorder doesn't print 2. In Selective Recording option the following message is displayed : "Recorder door is opened" 3. In the upper right corner of the screen, appears the icon "REC"	O.K		

Table 1:

Par.	Subject	Description	Specifications	Measured value	Result: Pass/ Fail
15.2	Remove the Chart paper, from the Recorder, and close the door.	Verify: 1. Recorder doesn't print 2. In Selective Recording option the following message is displayed : "Recorder is out of paper" 3. In the upper right corner of the screen, appears the "REC" icon	O.K		
15.3	Insert into the Recorder the chart paper, and close the door.	Verify: 1. Recorder starts to print. 2. In Selective Recording option no message is displayed. 3. In the upper right corner of the screen, the "REC" icon disappears, after printing has finished.	O.K		

Tested by _____ **Date** _____

APPENDIX G:
DECLARATION OF CONFORMITY TO IEC 60601-2-27

The Menntor X7 monitor ECG complies with IEC 60601-2-27 and the following specific paragraphs

1. Par. 201.7.9.2.9.101 , b) 4)

   Heart rate meter accuracy and response to irregular rhythm..

2. Par. 201.12.1.101.8 * Frequency and impulse response

   The Menntor X7 monitor uses a proprietary QRS detection algorithm that provides Frequency and impulse response per the requirement of the standard

3. Par. 201.12.1.101.13 Rejection of pacemaker pulses

   The Menntor X7 monitor uses a proprietary QRS detection algorithm that provides rejection of pacemaker pulse from the QRS detection.

4. Par. 201.12.1.101.17 Tall T-wave rejection capability

   The Menntor X7 monitor uses a proprietary QRS detection algorithm that provides rejection of tall T-wave per the requirement of the standar